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DATA TRANSLATOR
VERSION IIA, RELEASE 2
USER MANUAL
(REVISION 1)

DEFENSE COMMUNICATIONS AGENCY

USERS MANUAL

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The Version IIA Release 2. Data Translator User M provide a complete guide for a WWMCCS H-6000 or of the University of Michigan software built to r bases. The manual contains an overview of the reguides in writing the necessary Data Translator trol card set-ups, examples of output, and error	anual is intended to 6000 user in the use estructure IDS data- structuring process, specifications, con-
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March 1977

DATA TRANSLATOR VERSION IIA RELEASE 2 USER MANUAL (Revision 1)

BY

ERIC KINTZER, JAMES BODWIN, WILLIAM COOL, LINDA HUTCHINS, ANDREW MARINE, KENNETH MOORE, DONALD SWARTWOUT, GREG WOLFE

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VERSION IIA RELEASE 2
USER MANUAL

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PREFACE

This User Manual provides detailed instructions for the preparation and definition of databases to be processed by Version IIA Release 2 Data Translator. The Version IIA Release 2 Translator is the third prototype implementation of a generalized data conversion and restructuring capability developed by the University of Michigan for CCTC/WAD. It is the first "operational" translator and therefore should be considered experimental in Nature. Our purpose in releasing the translator and associated Users Manual is to allow the User Community a chance to use and comment on the desirability of this capability and documentation. Such feedback would provide the basis for improved documentation and software capability.

It is assumed that the reader has a reasonably high level of Honeywell

expertise. Specifically, the user should be familiar with:

Sequential, ISP, and IDS files Control card sequences IDS database design Timesharing

Please address all comments to both -

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1.0 INTRODUCTION TO DATA TRANSLATION

The Data Translation Project at the University of Michigan has developed a Data Translator which is capable of reorganizing WWDMS databases (Sequential, ISP, and IDS) by altering the logical structure and by modifying the physical structure. The work was completed on a Honeywell 6060 computer under a contract from the Command and Control Technical Center WWMCCS ADP Directorate (Code 400) of the Defense Communications Agency. The Data Translator is a complex and sophisticated software package, yet is understandable and easy to use. This manual describes the capabilities of the Data Translator, how to use the software, and an example of its use.

1.1 Background to Translation

This Data Translator is the product of many years of research and development. Previous Translators lacked many of the features of the current release. Refer to Table 1-1 for a comparison of Data Translator features. The Version I was developed to show the feasibility of the generalized Data Translator. Version II was to be an extension of Version I since it was capable of handling tree-type data structures. The Version IIA Release 1 was designed in response to the demand for a network Data Translator. The Release 2 overcomes Release 1's performance problems and presents some new features. All of the capabilities of the Release 2 Data Translator are detailed in Section 1.2.

Originally, when a user needed to represent his data in a new way, he would write, or have written, a program to change the data (Figure 1-1). If a different data representation were required, another program was needed. The cost of data translation was, therefore, very high since a large amount

of programming effort was used in a one time application.

The current state-of-the-art approach to data translation is to use a generalized data translator (Figure 1-2). This approach is exemplified by the Version IIA Release 2 Data Translator. The generalized approach uses programs which have been written and descriptions of the old and new data-bases (herein referred to as source and target databases) and of the transformation between source and target databases. The architecture of the Data Translator will be described in Section 1.3.

1.2 Capabilities and Limitations of the Version IIA Release 2 Data Translator

- Up to five source databases can be combined and restructured. The source databases may comprise any combination of WWDMS sequential, ISP or IDS databases.
- Up to five target databases can be written. The target databases must be legal IDS databases.
- 3. The physical structure of the target database may be different from that of the source database. Therefore, page range, page size, PLACE NEAR, etc., can be changed to improve database performance.
- User-implemented relations, such as phantom chains, pointer arrays, or match-keys, within and between source databases can be restructured into legal IDS chains in the target database.

Data Translator	Date Completed	Source DBMS	Target DBMS	Restructuring	Language Analyzers +	Typical CPU Time *	Internal Data Model
Version I	161 161 161 161 161 161 161 161 161 161	NIPS, WWDMS Sequential	NIPS, WWDMS Sequential	Some	SDOL	ingings ingings ago to the s m a tr	258 - 58 28284 941352123
Version II	Not Implemented			move in the second seco	91 (1) 273 212 12 3 3 6 7 2 4 5 4 7		Hierarchical
Version IIA Release l	June 1976	IDS	105	Very powerful	SDDL IDS MD TDL	80 years	Hot verse a
Version IIA Release 2	December 1976	WWDMS Sequential, ISP, IDS	SQ .	Complete	TDS MO	1 weekend	Network and Relational

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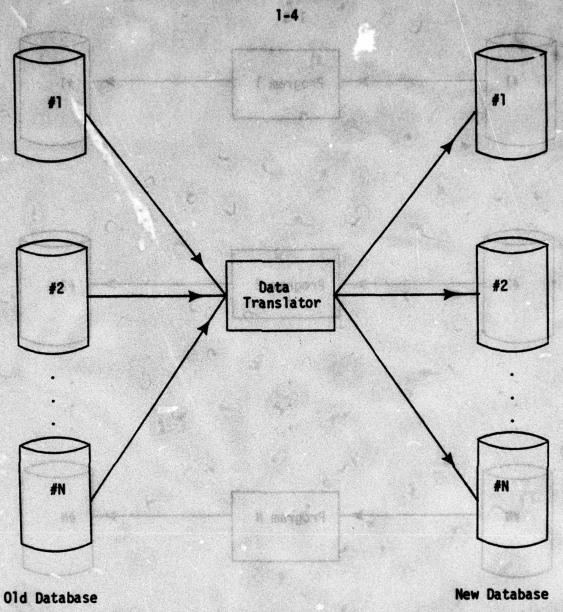
SDDL - Stored Data Definition Language TDL - Translation Definition Language

Figure 1-1 Conversion Program Approach to Data Translation

online translater Appropriate to Data Translation

Old Database

New Database



modulationers soul Figure 1-2
Data Translator Approach to Data Translation

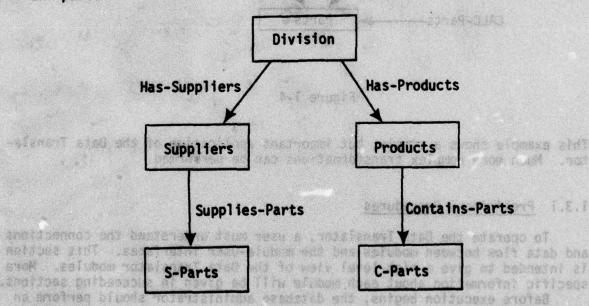
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- 5. Contained-in-repeating groups at the 03-49 level in the source database can be expanded into their own 01 level record types to become the detail of the 01 record in which they were contained.
- 6. Data items can be added, deleted or have their physical representation altered between the source and target databases.
- Relations between records can be added, deleted or modified between the source and target databases depending on user-specified criteria.
- 8. Records can be added, deleted, or have their item contents changed between the source and target databases, depending on user-specified criteria.
 - 9. New record types can be created in the target database from aggregations of source records. Duplicate data can be eliminated or created.
 - 10. To facilitate the translation of large databases, the translation process can be stopped and restarted at a later time.

1.3 Overview of Translation

There are many reasons why a user would desire a new database structure. Common reasons include the need to satisfy new processing requirements, and performance improvement. For example, suppose a company had the following ISP data structure relating divisions in the company, its products, suppliers and parts:



bas lights and not not not be Figure 1-3 High wangs to assess to bil he would be tend and filly depict Source Database 25 years and well paratoristable

the seurce database

analysis of the requirements for the target database. This involves drawing

Serause the Data Translator allows the transformation of the means to make administrator and the means to the contract the database administrator and the contract the contract that the contract the contract that the contract the contract that the

This implementation of the database was initially successful, but since the company has grown and increased its product line, the old database is no longer sufficient. This inadequacy stems from the following reasons;

- 1. Updating parts records takes a long time since parts data is stored in both S-PARTS and C-PARTS records.
 - 2. Direct access of either parts record is slow due to extra time spent searching overflow chains.
 - 3. Parts reports are hard to produce due to the duplicate part data.

The database administrator of the company has recognized these problems and decided that an IDS database with the following structure will perform better:

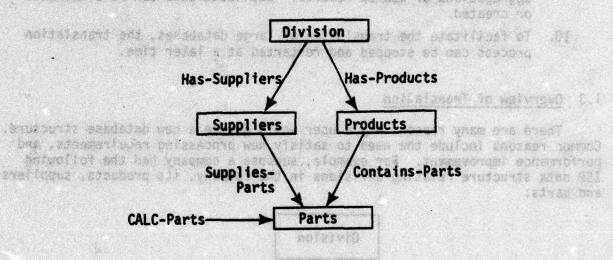


Figure 1-4

This example shows a simple, but important application of the Data Translator. Much more complex transformations can be performed.

Has-Suppliers

1.3.1 Preliminary Procedures

Hes-Products

To operate the Data Translator, a user must understand the connections and data flow between modules and the module-user interfaces. This section is intended to give a high-level view of the Data Translator modules. More specific information about each module will be given in succeeding sections.

Before execution begins, the database administrator should perform an analysis of the requirements for the target database. This involves drawing an IDS database diagram, writing an IDS MD section for the target, and determining how the records and chains in the target will be created from the source database.

Because the Data Translator allows the transformation of the user-implemented relations into IDS chains the database administrator should

examine the source database for these non-IDS constructs. If their information is to be preserved in the target, then explicit specification of the relation will be necessary in order for the Data Translator to be aware of their existence.

1.3.2 The Data Translation Process

To perform completely the data translation procedure, the user must complete six separate steps. The first two steps involve writing descriptions of the source and target databases using their MD sections and level 61 extensions. Those descriptions should be run through the IDS Analyzer to produce source and target SDDL (Stored Data Definition Language) tables. The third step is encoding the source-to-target transformation in the TDL (Translation Definition Language) and running the TDL Analyzer to produce TDL tables. The fourth step, Reader execution, creates the Restructurer Internal Form (RIF) of the source database(s). The Restructurer produces the target RIF database in the fifth step. The target IDS database(s) is produced by running the Writer. The entire Data Translation process is shown in Figure 1-5 and an example is included in Section 11.

1.3.3 Database Description

The Data Translator is a description-driven process. The translation modules must know the format of the source and target databases and the rules for creating records and chains in the target database from the

records and chains in the source database.

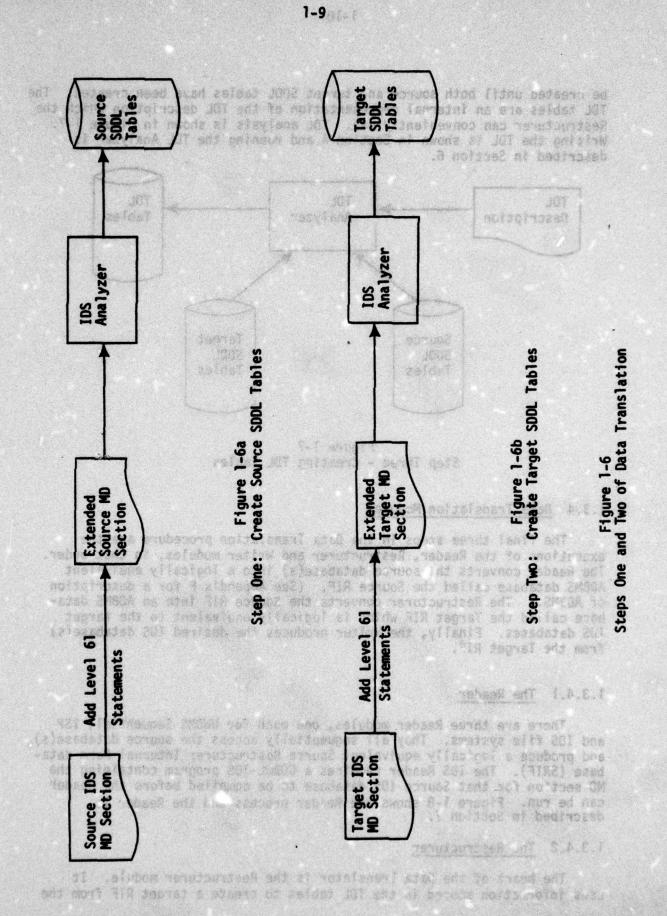
The descriptions of the source and target databases are the source and target MD sections and additional information needed to restructure the stabase. If the source database is IDS, no new source MD section is sary. If the source database is WWDMS Sequential or ISP, however, a S MD which describes the source database will have to be written. At MD section for the target database will also have to be written. At the MD sections have been collected or written, and additional informa on encoded as special level 61 statements, the extended MDs are ready to be used. The IDS Analyzer uses the extended MD sections to produce source and target SDDL tables. These first two steps are shown in Figure 1-6.

The SDDL tables are databases which hold information describing the source or target database. SDDL tables are analogous to the IDS Definition Structure which describes IDS databases. If multiple source or target databases have been described, there will be only one source or target SDDL tables file. Writing 61 levels is described in Section 3; running the IDS

Analyzer is described in Section 5.

The final description to be written details the transformation between the source and target databases. That description must be written in the Translation Definition Language (TDL). The TDL describes how to create target records using the source records and chains. It is imperative that the TDL description be correct and validated. If the user does not write the TDL description properly, the output of the Translator will be invalid and the Restructuring will have to be repeated.

The third step of the Translation process is running the TDL description through the TDL Analyzer to produce TDL tables. The TDL tables cannot



be created until both source and target SDDL tables have been created. The TDL tables are an internal representation of the TDL description which the Restructurer can conveniently use. TDL analysis is shown in Figure 1-7. Writing the TDL is shown in Section 4 and running the TDL Analyzer is described in Section 6.

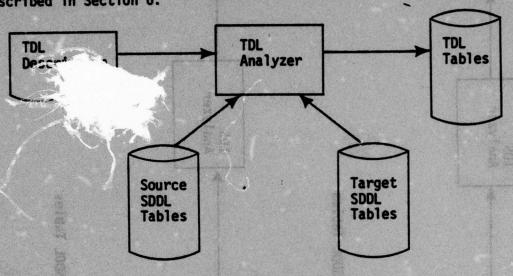


Figure 1-7
Step Three - Creating TDL Tables

1.3.4 Data Translation Modules

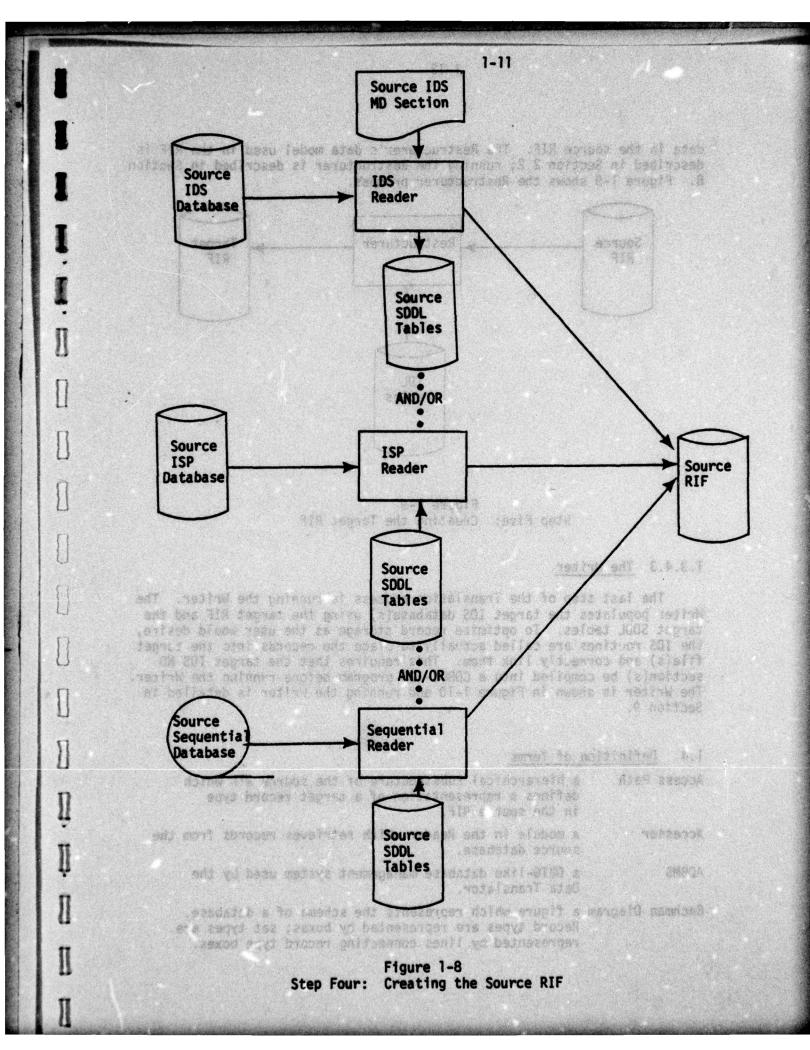
The final three steps in the Data Translation procedure are the executions of the Reader, Restructurer and Writer modules, in that order. The Reader converts the source database(s) into a logically equivalent ADBMS database called the Source RIF. (See Appendix F for a description of ADBMS.) The Restructurer converts the Source RIF into an ADBMS database called the Target RIF which is logically equivalent to the target IDS databases. Finally, the Writer produces the desired IDS database(s) from the Target RIF.

1.3.4.1 The Reader

There are three Reader modules, one each for WWDMS Sequential, ISP and IDS file systems. They all sequentially access the source database(s) and produce a logically equivalent Source Restructurer Internal Form database (SRIF). The IDS Reader requires a COBOL-IDS program containing the MD section for that Source IDS database to be compiled before the Reader can be run. Figure 1-8 shows the Reader process and the Reader is described in Section 7.

1.3.4.2 The Restructurer

The heart of the Data Translator is the Restructurer module. It uses information stored in the TDL tables to create a target RIF from the



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data in the source RIF. The Restructurer's data model used in the RIF is described in Section 2.2; running the Restructurer is described in Section 8. Figure 1-9 shows the Restructurer process.

Source 106

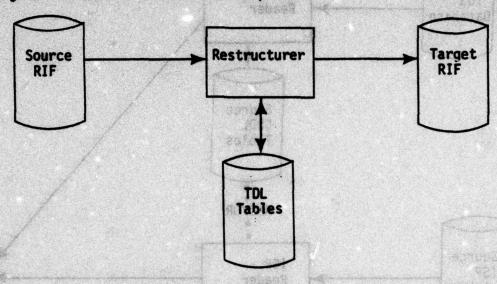


Figure 1-9
Step Five: Creating the Target RIF

1.3.4.3 The Writer

The last step of the Translation process is running the Writer. The Writer populates the target IDS database(s) using the target RIF and the target SDDL tables. To optimize record storage as the user would desire, the IDS routines are called actually to place the records into the target file(s) and correctly link them. This requires that the target IDS MD section(s) be compiled into a COBOL-IDS program before running the Writer. The Writer is shown in Figure 1-10 and running the Writer is detailed in Section 9.

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1.4 <u>Definition of Terms</u>

Access Path a hierarchical substructure of the source RIF which

defines a representation of a target record type

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in the source RIF.

Accessor a module in the Reader which retrieves records from the

Ster Force Creating the Sairt and

source database.

ADBMS a DBTG-like database management system used by the

Data Translator.

Bachman Diagram a figure which represents the schema of a database.

Record types are represented by boxes; set types are represented by lines connecting record type boxes.

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122's unyeated means of libering records together into

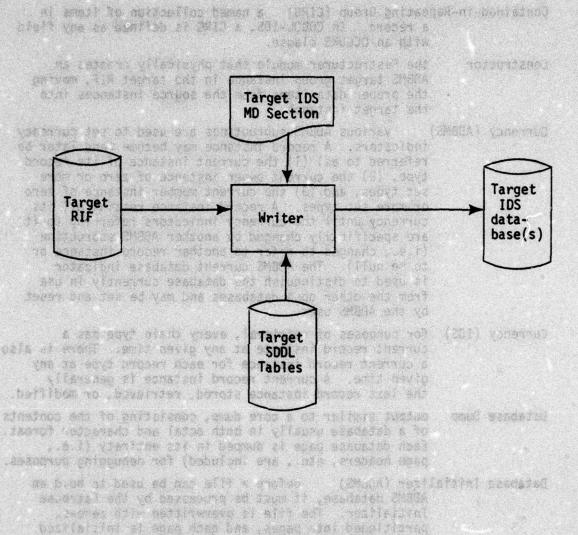


Figure 1-10
Step Six: Creating the Target IDS Database(s)

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Chain (IDS) IDS's physical means of linking records together into relations. All chains are mapped as linked lists. The ADBMS equivalent is a set.

Contained-in-Repeating Group (CIRG) a named collection of items in a record. In COBOL-IDS, a CIRG is defined as any field with an OCCURS clause.

Constructor the Restructurer module that physically creates an ADBMS target group instance in the target RIF, moving the proper data items from the source instances into the target instance.

Currency (ADBMS) various ADBMS subroutines are used to set currency indicators. A record instance may become (and later be referred to as) (1) the current instance of its record type, (2) the current owner instance of zero or more set types, and (3) the current member instance of zero or more set types. A record instance retains all its currency until the currency indicators referring to it are specifically changed by another ADBMS subroutine (i.e., changed to refer to another record instance or to be null). The ADBMS current database indicator is used to distinguish the database currently in use from the other open databases and may be set and reset by the ADBMS user.

Currency (IDS) for purposes of retrieval, every chain type has a current record instance at any given time. There is also a current record instance for each record type at any given time. A current record instance is generally the last record instance stored, retrieved, or modified.

Database Dump output similar to a core dump, consisting of the contents of a database usually in both octal and character format. Each database page is dumped in its entirety (i.e., page headers, etc., are included) for debugging purposes.

Database Initializer (ADBMS) before a file can be used to hold an ADBMS database, it must be processed by the Database Initializer. The file is overwritten with zeroes, partitioned into pages, and each page is initialized with a page header record. The ADBMS DBT is written onto the file starting at page one. A record of the type SYSTEM is placed on the page following the DBT.

Database Initializer (IDS) all IDS databases, upon their creation, must be initialized with page header records before any data can be stored in them. This is done via utility routine QUTI.

Database Name

the string of characters after the database declaration in the IDS Analyzer's run-time parameter file.

This name is used by the Reader and Hriter modules to establish currency in the SDDL tables.

Database Tables (DBT) the output of the DDL Analyzer. These tables contain a description of the database schema in a form usable by ADBMS and are stored in the first pages of the database.

Database Tables File (DBTF) a sequential file which contains the Database Tables for a database.

DDL - Data Definition Language a language used to describe the schema of a database in terms of the three basic ADBMS constructs: the item, the record, and the set. DDL text serves as input to the DDL Analyzer.

DDL Analyzer a language analyzer that accepts as inputs ADBMS DDL and produces as output Database Tables (DBT).

DDL Writer a module that scans SDDL tables and produces as output ADBMS DDL text suitable for input to the DDL Analyzer.

DDL Writer Work Database an ADBMS database used by the DDL Writer.

Detail every relation in IDS has one parent record type and up to 99 dependent record types. The dependent of a chain is called a detail. The ADBMS equivalent is a member.

DRT (Deferred Reference Table) an ADBMS database used by the populator to maintain information about subsets in the source RIF.

Extended MD Section to describe databases to the Data Translator, the source and target MD sections are augmented with additional information. The additional data is represented with level 61 entries.

Field (ADBMS) see item (ADBMS).

Field (IDS)

IDS records are comprised of elementary items (fields) that represent a unit of data. IDS is aware of fields only at the 02 level.

Group see record (ADBMS).

Hash Database (ADBMS) an ADBMS database which contains one or more hash record types.

Hash Input (ADBMS) input required by the Database Initializer when initializing hash databases.

Hash Record (ADBMS) an ADBMS record type whose instances are stored and retrieved by hashing, i.e., calculating the record's address by randomizing on the primary key.

IDS (Integrated Data Store) a network database management system on the Honeywell H-6000 used as a source and the target of translation.

IDS Analyzer

A Data Translator module that accepts an extended MD section, which describes a user's database in textual form and produces SDDL tables which are used by other translator modules.

IDS Query Dictionary an IDS database produced from the extended MD section by the IDS Translator in query mode. It is read in as input to the IDS Analyzer.

IDS Structure Table produced as the common area .IDS.. by every IDS compilation. It is an internal encoded table that describes an IDS database. It is formally known as the IDS Definition Structure.

IDS Translator The IDS compiler invoked via the \$IDS card. When configured in query mode, the IDS Translator produces the IDS Query dictionary.

Incremental Reading the process of reading a source IDS database in multiple runs of the IDS Reader. The IDS Reader can be used to process the source database in a user-specified number of runs.

Instance an occurrence of one object within a type or class, as distinguished from type. Example: an instance of record type PERSON is "JOHN SMITH".

ISP an indexed-sequential file organization. Databases in ISP form (if conforming to WWDMS T-2 rules) can be converted to IDS databases by the Data Translator.

Item (ADBMS) the elementary unit of data in an ADBMS record. Synonymous with field.

Item (IDS) see Field (IDS).

Item Conversion since only certain data types are supported by the Restructurer the Reader and Writer must perform item conversion for IDS items (fields) that are in data formats supported by IDS but not by the Restructurer.

Library a file used to hold the object modules of several logically or functionally related subroutines.

Logically Deleted Record (ADBMS) a record in an IDS database which has been flagged as deleted but has not yet been physically deleted from the database.

Master every relation type in IDS has one parent record type and up to 99 detail record types. The parent of a chain is called a master. The ADBMS equivalent is owner.

Match-Key Relation a non-IDS relation between record types in the source database(s). Implemented by having identical item values in different record instances.

Match-Key Set (ADBMS) an ADBMS set implemented by storing the primary key of the owner record instance in the set-significant items of one or more member record instances.

Member a dependent record type in an ADBMS set is called a member. The IDS equivalent is detail.

Multiple Database (ADBMS) refers to the fact that the Data Translator must have several databases open at the same time (SDDL tables, TDL tables, source and target RIFs, etc.). The multiple database capability is part of ADBMS.

Multiple Database (User) the Data Translator has the capability to accept as many as five source database schemas (IDS, ISP, or sequential or any combination thereof) and produce as many as five target IDS databases. Each target database can be derived from some or all of the source databases.

Owner a parent record type in an ADBMS set is called an owner.

The IDS equivalent is master.

Page (ADBMS) an ADBMS database is made up of one or more database pages. The page is the smallest unit that can be moved from mass storage to core and back. The ADBMS page length is 1024 words.

Page (IDS) an IDS database is broken into physical access units called pages. Each page in a subfile is of identical size and must be a multiple of 64 words.

Partial Writing the process of outputting a target database over several execution runs. Permits the user to write a target file when computer time resources are constrained.

Phantom Pointer Relation a set or relation in an IDS database which is maintained by the user. Set membership is based on IDS reference codes stored in user data items.

Physically Deleted Record (ADBMS) see Logically Deleted Record (ADBMS),

Physically Deleted Record (IDS) a record which was logically deleted from an IDS database, has been removed from all of its sets and its space on the page reclaimed.

Plex Group a group or record in a network database that is a member of more than one set type (ADBMS) or chain type (IDS).

Pointer Array a CIRG in an IDS database in which the user has stored IDS reference codes. (see also Phantom Pointer).

Populator a module in the Reader which controls the set linking process in the source RIF.

Primary Key (ADBMS) a collection of data items in an ADBMS hash record type whose combined values uniquely determine an instance of the hash record type and are used in the storage and retrieval process.

Qualification in the restructuring process, the testing of source item values to determine if and/or how a target group instance is to be built.

Qualifier the Restructurer module that performs qualification.

Query a request to a database for information that satisfies one or more specified criteria. The request is made via

the Database Management System.

Reader the Translator module which transforms the user's

database(s) into a logically equivalent ADBMS database (source RIF). There are three Reader modules: one

each for IDS, ISP, and Sequential files.

Real Parent the actual owner instance of a set instance in the source

RIF. (see also Surrogate Parent).

Record (ADBMS) a named collection of zero or more items. Synonymous

with group.

Record (IDS) a named collection of zero or more fields.

Reference Code each record instance within an IDS database has a logical address which is unique. This address is

known as a reference node and is divided into two parts - a page number and a line number within that

page.

Relation synonymous with set (ADBMS) and chain (IDS).

Restructurer the Translator module that produces the target RIF

from the source RIF and the TDL tables.

Restructuring the process of altering the logical structure or

schema of a database.

Restructuring-by-Parts the process of restructuring a database using several Restructurer runs as opposed to a single run.

Each run processes only a few access paths at a time.

The target records produced by each run are stored in

the same target RIF.

RIF (Restructurer Internal Form) the standardized database format provided by ADBMS along with certain restrictions required by the Version IIA Release 2 restructuring

algorithm.

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Run-time Parameter a data value, used as input to a program, which is specified in the JCL.

Run-time Parameter File a data area from which run-time parameters are read.

Schema a description of the logical structure of a database.

SDDL Tables the output of the IDS Analyzer. The SDDL tables are an ADBMS database in which all the information contained

in the extended MD section is stored.

Sequential Database any user database not under the control of ISP or IDS, e.g., a system standard format file, manageable by GFREC. The Data Translator will accept sequential databases as input to the Reader provided that they

conform to WWDMS T-2 restrictions.

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an ADBMS construct used to define a relationship between two record types known as the owner and the member record types for the set type. An instance of an ADBMS ordered set is always implemented as a linked list consisting of one instance of the owner record type for that set type and one or more instances of the member record type for that set type. An instance of an ADBMS match-key set always consists of one instance of the owner record type and one or more instances of the member record type, each having the primary key of the owner record instance in their set-significant items. The IDS equivalent of the ADBMS ordered set is the chain.

Set-Significant Items (ADBMS) a collection of data items in the member record type of a match-key set. The items establish a member record instance in a match-key set instance when they contain the primary key of an owner record instance.

Sibling an IDS record type which is a detail of a chain type which also has other detail record types.

Source Accessor a Restructurer module that accesses record instances in the source RIF, driven by the stack that was passed to it by the Stack Builder.

Source Group an ADBMS record or group (either type or instance) in the source RIF. (Abbreviated SGROUP, SG).

SRIF (Source RIF) an ADBMS RIF database which is produced by the Reader from the user's source database(s).

Stack Builder a Restructurer module that reads access paths in tree format from the TDL tables and produces a stack which drives the Source Accessor.

Subfile a file which contains part of an IDS database. IDS databases can be divided into many GCOS physical files for a variety of reasons.

Subset * a set instance in the source RIF which contains fewer record instances than the same set instance in the IDS database. Note that a set instance in the IDS database may be composed of many subsets.

Surrogate Parent a dummy record created in the source RIF by the Populator. System Access Set

in an RIF database, each record type is a member of a system-owned set type called its System Access Set. All instances of each record type are made members of their System Access Set for ease of retrieval.

those records in a database schema from which a System Entry Point database traversal may start. Examples are CALC records, or the top record in a tree structure. Furthermore, a relation is defined by the IDS Analyzer in which the system entry point record is the member and the SYSTEM record is the owner.

System Generation Tape a tape which contains all of the files and JCL necessary to run the Data Translator.

SYSTEM Record every ADBMS database has exactly one instance of record type SYSTEM placed in the database by the Database Initializer. The SYSTEM record instance allows the user to "enter" the database using ADBMS sets since it is always the current SYSTEM record.

Target Group (Target Record) an ADBMS record (either type or instance) in the target RIF (Abbreviated TGROUP, TG).

Target Relation (Target SET) an ADBMS set (either type or instance) in the target RIF.

TDL Translation Definition Language, a language used to describe the mapping of the logical structure of the source RIF to the logical structure of the target RIF.

TDL Analyzer a language analyzer that accepts as input TDL text and produces as output TDL tables.

TDL Tables the output of the TDL Analyzer. The TDL tables are an ADBMS database in which all the information contained in the TDL text is stored.

Translation Library a GCOS library file containing all of the ADBMS, GMAP and utility routines needed to run the Data Translator.

TRIF (Target RIF) the ADBMS RIF database that is produced by the Restructurer from the source RIF and the specification in the TDL tables.

Type a class of objects, as opposed to an instance or occurrence of an object of a type (e.g., a record type PERSON is composed of item types NAME, AGE, and SS NUM).

User Conversion Routine a user-written routine that performs conversions on source RIF item values before they are assigned to items in the target RIF records. The existence of a converison routine is declared in the TDL description. The conversion routine is called by the Constructor when the target record instances are being built by the Restructurer.

User Input Directives user-supplied textual statements that control certain aspects of a Restructurer run, e.g., whether or not debug output is to be produced.

User Input Processor a Restructurer module that processes the User Input Directives.

User Qualification Routine a user-written routine which performs a particular type of qualification. The existence of a qualification routine is noted in the TDL tables. It is called by the Qualifier when the target group instances are being built by the Restructurer.

Writer

the final translation module. Its job is to transfer data records from the target RIF into the target IDS database preserving all information content.

1.5 Resource Requirements

The Data Translator can be used only on Honeywell 6000 and 600 series computers. The following conditions must be satisfied to run the Data Translator.

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- 1. IDS must be in use. ISP must be available to translate ISP databases.
 - 2. One processor and at least 256K of core must be available.
 - 3. Secondary storage (disk) at least three times larger than the size of the source or target databases should be available.
 - 4. One 9-track tape drive should be available.
 - IDS Data Query must be available.

1.5.1 Hardware Configuration

It is difficult to determine an optimal system configuration for the Data Translator since each application and installation is unique. But, there are some rules to follow which will help to improve efficiency.

- 1. Each module has an estimated records/hour (CPU) rate. It is based on fifty to seventy-five characters per average record. Do not attempt to translate more data than is physically possible given existing computer time constraints. Make full use of the partial or incremental translation features described in Sections 7-9.
- 2. Attempt to perform translation on a dedicated system. Tests have shown that running multiple processors will statistically affect total elapsed time.

1.6 Translation Summary

Table 1-2 correlates the basic translation steps with the Input/Output requirements and the estimated time to perform each step.

Step	Description		Outputs	Estimated Time to Perform:
1	Write 61 levels for source database(s) and run IDS Analyzer	1. MD section and 61 levels	1. Source SDDL Table	l man-day
2.	Write 61 levels and MD section to target database(s) and run IDS Analyzer	1. MD section and 61 levels	1. Target SDDL Table	2 man-days
3.	Write TDL Description and run TDL Analyzer	1. TDL Description	1. TDL Tables	2 man-days
4.	Run the Reader	3. Source MD	1. Source RIF	1-2 machine days
5.	Run the Restructurer	1. Source RIF 2. TDL tables 3. Target SDDL tables	1. Target RIF	1-2 machine days
6.	Run the Writer	1. Target RIF 2. Target SDDL tables 3. Target MD section	1. Target IDS database(s)	1 machine day

Table 1-2: Data Translation Summary

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2.0 PREPARING FOR DATA TRANSLATION

This section describes the pre-translation preparations that must be completed before the translation specifications (i.e., 61 levels and TDL) can be written.

5.5

2.1 RIF Constructs

The Restructurer accepts only databases that conform to the rules for Restructurer Internal Form (RIF) databases. That is, the database must be a collection of records. Records are made up of items, and are related by means of sets ("set" is synonymous with the IDS term "chain". A set's owner type is the chain master, and the member type is the chain detail). Certain constructs are not permitted in a RIF database. If they exist in the source IDS database, their resolution into RIF constructs must be specified in 61 level statements added to the MD section. The use of 61 levels is described in detail in Section 3 of this manual.

Illegal constructs in RIFs:

 Sets with multiple owner and/or member types. These must be resolved into several sets, one for each owner type/member type pair, as in Figure 2-1.

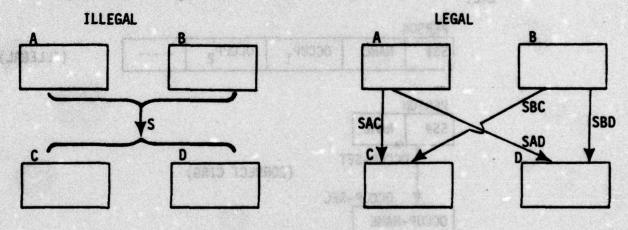


Figure 2-1
Resolution of Multiple Owner- and Member-Type Set

type and all the member record insta cas whose match-KCy Item entige are equal to the corresponding match-key item values for the numer record. Frome 2-3 gives an extaple of auch a set. The STATE record to the owner twos and the PEOPLE record, the season

 Phantom Chains. These are user-implemented chains whose pointers are IDS reference codes stored as fields in the master and detail records. Such chains can be declared in 61 level statements and implemented by the Reader as actual sets in the source RIF.

Naming groups. All elementary items in an MD section, regardless of level, are treated as simple items. For example, if the source MD section contains

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03 NUMBER

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then the source RIF HOUSE record would contain the items NUMBER, STREET, CITY, STATE, ZIP, and OWNER, but ADDR would have no meaning. If this is undesirable, an appropriate 61 level statement must be written.

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Contained-in-repeating groups (CIRGs). Repeating groups and items must be expanded into new group types and new sets, as in Figure 2-2.

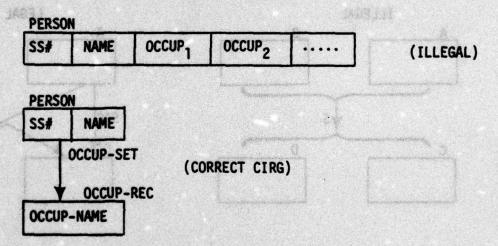
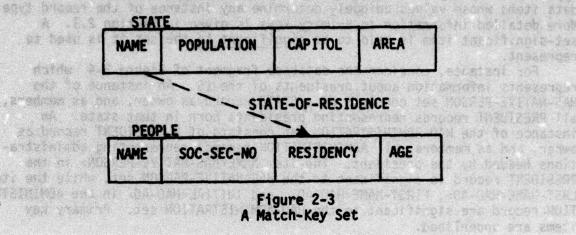


Figure 2-2 Resolution of a CIRG

5. Match-key sets. These are user-implemented sets in which one or more items in the owner and member record types are declared as match-key items. The match-key items in the member record type correspond one-for-one to the owner's match-key items. An instance of the match-key set consists of an instance of the owner record type and all the member record instances whose match-key item values are equal to the corresponding match-key item values in the owner record. Figure 2-3 gives an example of such a set. The STATE record is the owner type and the PEOPLE record, the member

type. The match-key set STATE-OF-RESIDENCE is implemented by the match-key items NAME in the STATE record and RESIDENCY in the PEOPLE record.



Match-key sets are described by 61 level statements, and are constructed by the Reader in the source RIF as explicit sets.

2.2 The Restructurer's Working View of Databases

During the construction of a database, two important tasks must be accomplished:

- a) all records must be constructed and given values for their data items, and
- b) all sets must be constructed.

In particular, this applies to the construction of target RIF databases by the Restructurer. Task a) is performed in a straightforward way, as directed by the user's TDL descriptions. The Restructurer's approach to task b) is also straightforward, but requires that the user understand the concept of a set-significant item, which is described in the remainder of this section.

2.2.1 Set-significant Items

IDS, as well as all modules of the Data Translator, requires that if a record type is declared a member of a set which is system-owned, then every instance of the record type must be a member of the set. Thus no additional effort is required to establish system-owned sets. When a set is not system-owned, however, some means (e.g., pointer fields, pointer arrays, special data items) must be used to establish whether or not a given instance of the member record type belongs to the set, and if so, to identify the correct owner record instance.

During the restructuring phase of data translation, this is accomplished by storing in each target RIF instance of the member record type, a copy of the primary key of the corresponding owner record instance. If the record is not to belong to the set, a suitable null string is stored. This data resides in a collection of <u>set-significant items</u> in the member record type. There is one set-significant item for each data item of the owner record type's primary key. The primary key of a record type is a collection of data items whose values uniquely determine any instance of the record type. More detailed information on primary keys is given in Section 2.3. A set-significant item is said to be <u>significant to</u> the set it is used to represent.

For instance, consider the database fragment of Figure 2-4 which represents information about presidents of the U.S. An instance of the HAS-NATIVE-PERSON set consists of a STATE record as owner, and as members, all PRESIDENT records representing presidents born in that state. An instance of the HAD-ADMINISTRATION set consists of a PRESIDENT record as owner, and as members, all ADMINISTRATION records representing administrations headed by the president. The item NAME<HAS-NATIVE-PERSON> in the PRESIDENT record is significant to the HAS-NATIVE-PERSON set, while the items LAST-NAME<HAD-AD>, FIRST-NAME<HAD-AD>, and INITIAL<HAD-AD> in the ADMINISTRATION record are significant to the HAD-ADMINISTRATION set. Primary key items are underlined.

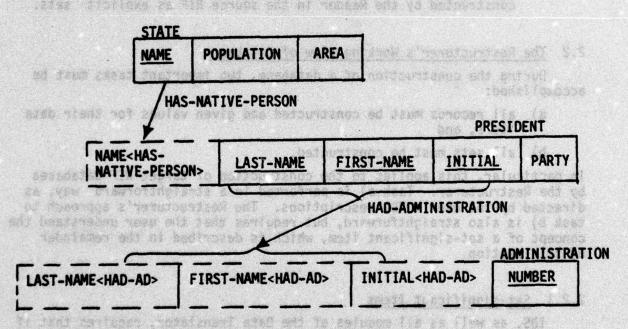


Figure 2-4 The Set-significant Items

Set-significant items are identified and named by the IDS Analyzer, subject to the following rules:

- Each set-significant item is significant to exactly one set.
 - The items significant to a particular set are in one-to-one correspondence with the items that make up the primary key of the owner record type.

3. Set-significant item names consist of the owner key item name followed by all or part of the set name enclosed in angle brackets.

Although set-significant items exist only in the target RIF, the IDS Analyzer identifies and names them for both source and target databases. This helps to insure uniform descriptions for user databases throughout the data translation process, and the source set-significant items may be used by the advanced TDL writer as if they existed in the source RIF.

2.2.2 Augmented Bachman Diagrams

At every stage of data translation, the user's chance of success is enhanced significantly by the use of carefully drawn Bachman diagrams to describe source and/or target data structures. Bachman diagrams wsed to describe source and target RIFs should be augmented to include all setsignificant items, as well as to indicate which data items in a record make up its primary key, and which set a set-significant item is used to establish. This may be done as follows:

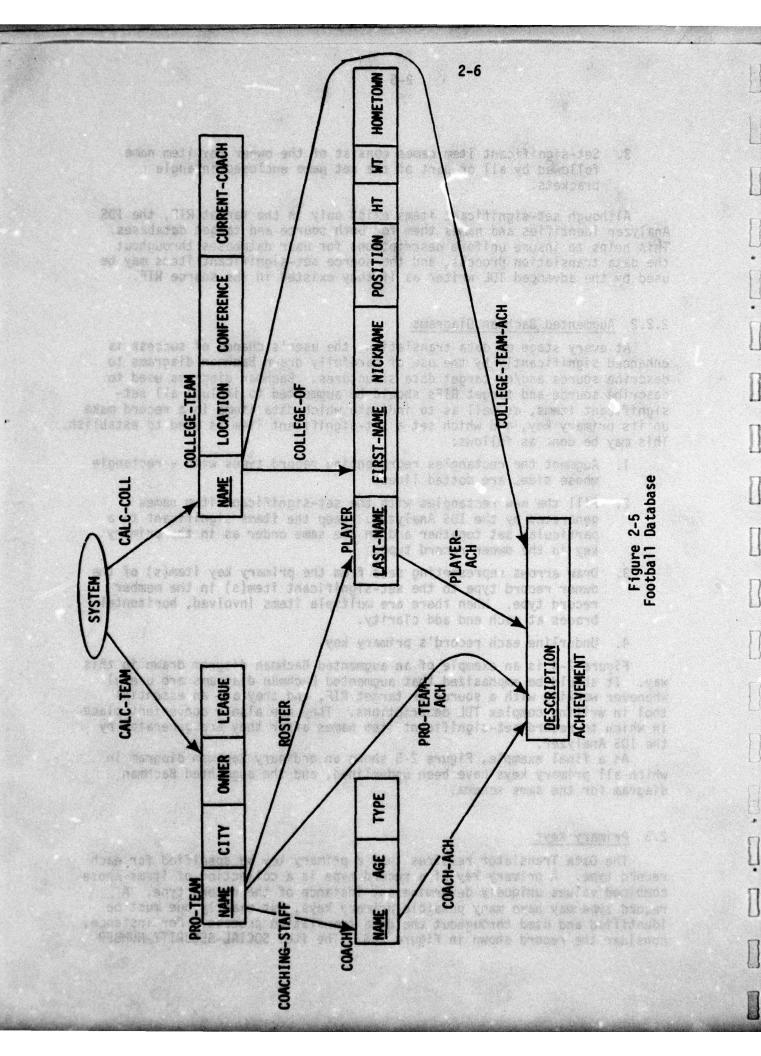
- 1. Augment the rectangles representing record types with a rectangle whose sides are dotted lines.
- 2. Fill the new rectangles with the set-significant item names generated by the IDS Analyzer. Keep the items significant to a particular set together and in the same order as in the primary key in the owner record type.
- 3. Draw arrows representing sets from the primary key item(s) of the owner record type to the set-significant item(s) in the member record type. When there are multiple items involved, horizontal braces at each end add clarity.
- 4. Underline each record's primary key.

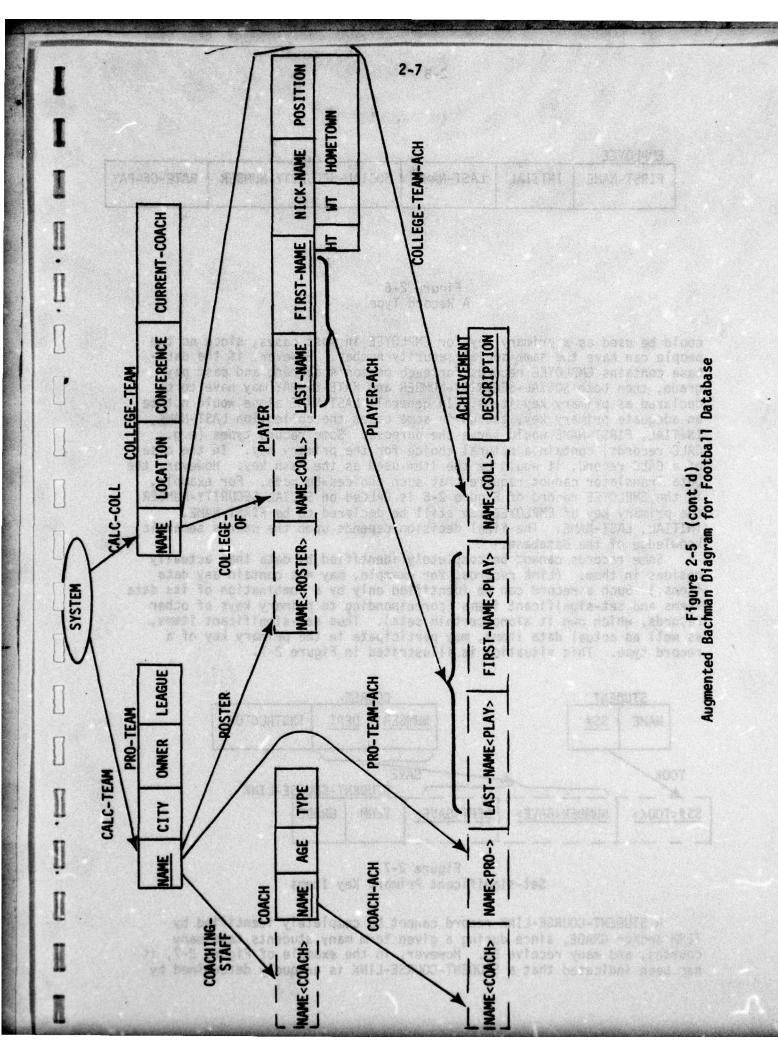
Figure 2-4 is an example of an augmented Bachman diagram drawn in this way. It should be emphasized that augmented Bachman diagrams are useful whenever working with a source or target RIF, and they are an essential tool in writing complex TDL descriptions. They are also a convenient place in which to record set-significant item names after they are generated by the IDS Analyzer.

As a final example, Figure 2-5 shows an ordinary Bachman diagram in which all primary keys have been underlined, and the augmented Bachman diagram for the same schema.

2.3 Primary Keys

The Data Translator requires that a primary key be specified for each record type. A primary key of a record type is a collection of items whose combined values uniquely determine any instance of the record type. A record type may have many possible primary keys, but exactly one must be identified and used throughout the data translation process. For instance, consider the record shown in Figure 2-6. The item SOCIAL-SECURITY-NUMBER





EMPLOYEE					
FIRST-NAME	INITIAL	LAST-NAME	SOCIAL-SECURITY-NUMBER	RATE-OF-PAY	

Figure 2-6 A Record Type

could be used as a primary key for EMPLOYEE in most cases, since no two people can have the same social security number. However, if the database contains EMPLOYEE records for each person's current and past pay grade, then both SOCIAL-SECURITY-NUMBER and RATE-OF-PAY may have to be declared as primary key items. In general, LAST-NAME alone would not be an adequate primary key, though in some cases the collection LAST-NAME, INITIAL, FIRST-NAME would serve the purpose. Some record types (e.g., CALC records) contain a natural choice for the primary key. In the case of a CALC record, it would be the item used as the hash key. However, the Data Translator cannot require that such choices be made. For example, if the EMPLOYEE record of Figure 2-6 is CALCed on SOCIAL-SECURITY-NUMBER, the primary key of EMPLOYEE may still be declared to be FIRST-NAME, INITIAL, LAST-NAME. The final decision depends upon the user's semantic knowledge of the database.

Some records cannot be completely identified by data that actually resides in them. (Link records, for example, may not contain any data items.) Such a record can be identified only by a combination of its data items and set-significant items (corresponding to primary keys of other records, which own it along certain sets). Thus set-significant items, as well as actual data items, may participate in the primary key of a

record type. This situation is illustrated in Figure 2-7.

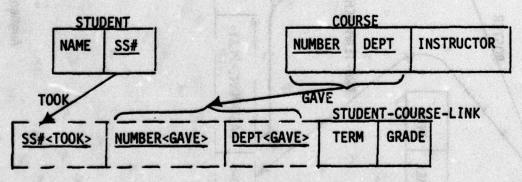


Figure 2-7
Set-significant Primary Key Items

A STUDENT-COURSE-LINK record cannot be completely identified by TERM and/or GRADE, since during a given term many students take many courses, and many receive Bs. However, in the example of Figure 2-7, it has been indicated that a STUDENT-COURSE-LINK is uniquely determined by

the SS# of the student who took the course, tegether with the course NUMBER and the DEPARTMENT that gave the course. If students are permitted to repeat courses, it may be necessary to include TERM in order to get

In some cases, a set-significant item may correspond to a primary key item in the owner record that is itself set-significant. Figure 2-8 gives an example. An EMPLOYEE is identified by SS#, and a PROJECT by by the DEPT that sponsors it and the SS# of its leader. There is one EMP-PROJ-LINK record for each employee currently working for each project. The use of a link record suggests that a project may employ many people, and that a person may work on several projects concurrently. Thus, to identify an EMP-PROJ-LINK record, one must know the employee's SS# as well as the identity of the project. Accordingly, all three set-significant items in the EMP-PROJ-LINK record participate in its primary key. A CONTRACT record, however, is uniquely determined by its CONTRACT#, so there is no need to specify additional primary key items.

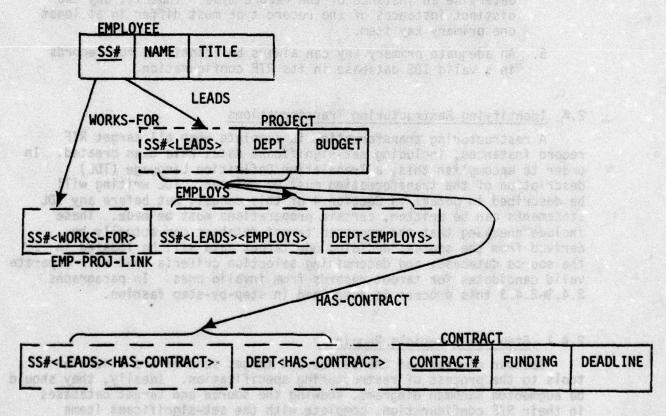


Figure 2-8
Set-significant Items that Correspond to
Set-significant Items

Set-significant primary key data is declared by a 61 level statement which identifies all sets whose set-significant items are to be primary key items in the member record type. Notice that this automatically enforces the following restriction; if one item significant to a particular set is also a primary key item, then all other items significant to that set are also primary key items.

Primary key identification may be summarized as follows:

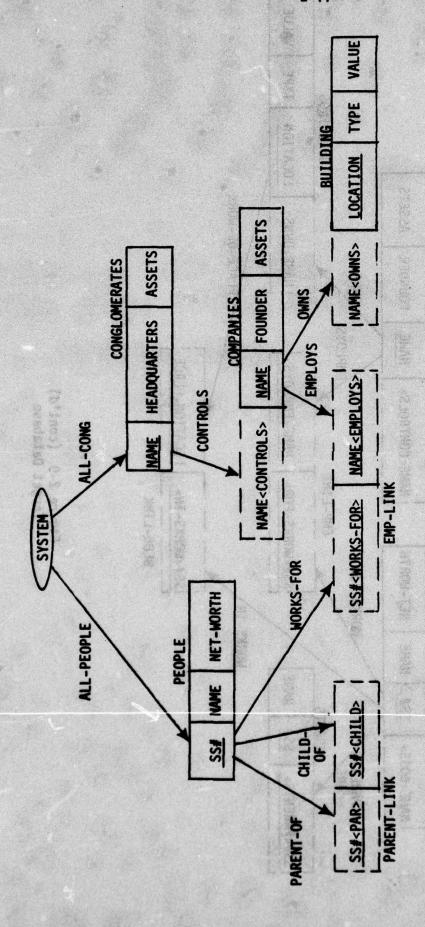
- For each record type, a collection of data items and sets must be declared as participants in the record's primary key. The declared data items and the items significant to the declared sets are referred to as the record's primary key items.
- 2. The record must be the valid member type for each set type.
- 3. None of the sets may be system-owned.
- 4. The combined values of the primary key items must uniquely determine an instance of the record type. That is, any two distinct instances of the record type must differ in at least one primary key item.
- 5. An adequate primary key can always be identified for records in a valid IDS database in its RIF configuration.

2.4 Identifying Restructuring Transformations

A restructuring transformation is complete when all target RIF record instances, including set-significant data, have been created. In order to accomplish this, a Translation Definition Language (TDL) description of the transformation must be written. TDL writing will be described in detail in Section 4 of this manual, but before any TDL statements can be written, certain preparations must be made. These include checking that the proposed target database can actually be derived from the source, deciding how target data will be located in the source database, and determining selection criteria that will separate valid candidates for target records from invalid ones. In paragraphs 2.4.1-2.4.3 this process is described in step-by-step fashion.

2.4.1 Step 1 - Materials Required

Bachman diagrams of the source and target schemas are essential tools to the process of restructuring specification. Ideally, they should be augmented Bachman diagrams, showing the source and target databases in their RIF configuration, complete with the set-significant items identified and named by the IDS Analyzer. However, it may not always be possible to complete the 61 level additions to the source and target MD sections and obtain a valid IDS Analyzer run before drawing up preliminary restructuring specifications. When this is the case, augmented diagrams should still be used with set-significant items named by the user. These will be replaced by actual names as soon as the IDS Analyzer can be successfully run.



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Figure 2-9 Source Database

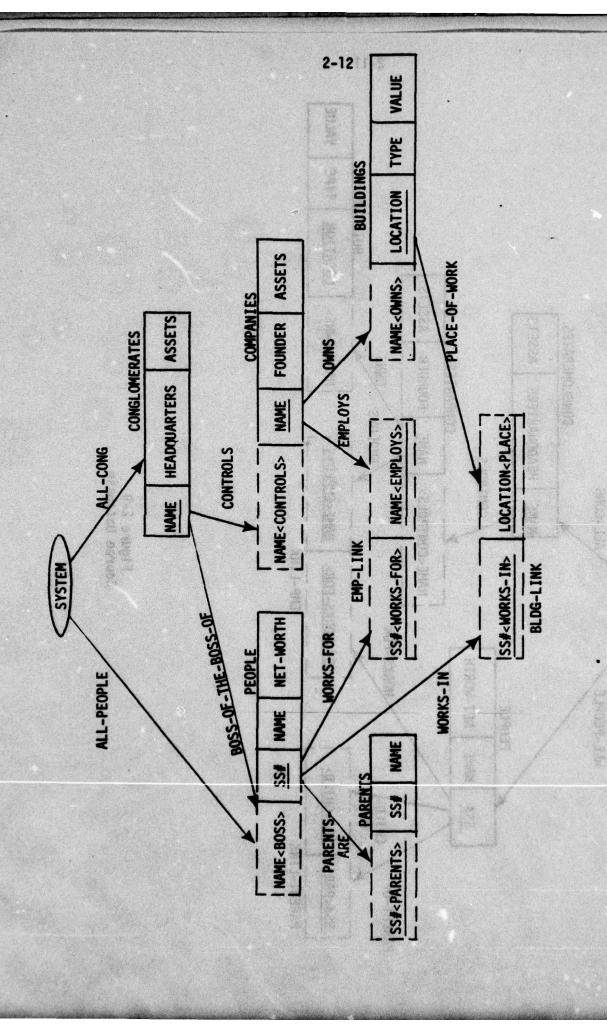


Figure 2-9 (cont'd)
Target Database

2.4.2 Step 2 - Semantic Validity of Proposed Restructuring

Restructuring cannot introduce new information into a database. Rather, during restructuring transformation, information is retrieved from its source representation and stored in its target representation. The information itself does not change. Thus, for a proposed restructuring to be semantically valid, every instance of every target record type must exist in some form in the source database. Furthermore, it must be distinguishable from other sets of source RIF instances of the same form which would not be valid instances of the proposed target record type. For example, consider the data structures shown in Figure 2-9. The target CONGLOMERATES, COMPANIES, EMP-LINK and BUILDINGS record types are certainly valid, since they already exist as source records. The target PEOPLE record is valid, provided that no person is permitted to work for two companies controlled by different conglomerates. in which case SS# would not be an adequate primary key. The form in which PEOPLE exists in the source is as follows; the tree in Figure 2-10 describes a subschema of the source database (non-directed arrows are used since the Restructurer traverses sets in both directions). Any instance of that tree defines a target PEOPLE record whose SS#, NAME, and NET-WORTH items are taken from the source PEOPLE record, and whose NAME<BOSS> item is the NAME item from the source CONGLOMERATES record.

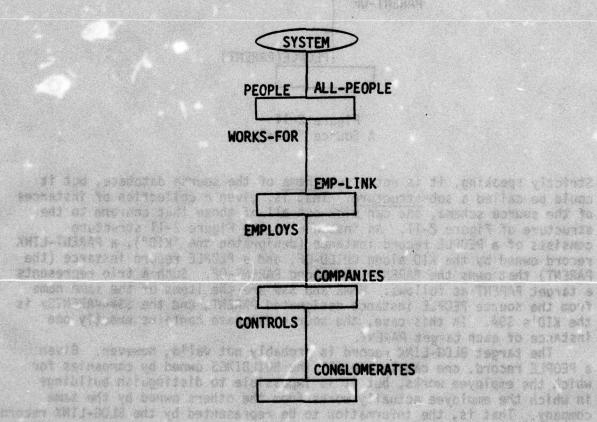


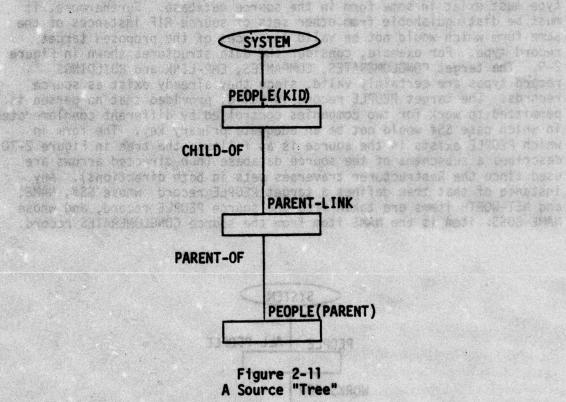
Figure 2-10 A Source Tree

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It should be pointed out that the source RIF may contain multiple instances of some target PEOPLE records. This will occur whenever a person works for two or more companies.

The target PARENT record is also valid, but its representation in the source RIF is slightly less obvious than that of PEOPLE. Figure 2-11 shows what may be considered to be a tree in the source database.



Strictly speaking, it is not a subschema of the source database, but it could be called a sub-structure. That is, given a collection of instances of the source schema, one can pick out all of those that conform to the structure of Figure 2-11. An instance of the Figure 2-11 structure consists of a PEOPLE record instance (designated the "KID"), a PARENT-LINK record owned by the KID along CHILD-OF, and a PEOPLE record instance (the PARENT) that owns the PARENT-LINK along PARENT-OF. Such a trio represents a target PARENT as follows: NAME and SS# are the items of the same name from the source PEOPLE instance designated PARENT, and the SS#<PARENTS> is the KID's SS#. In this case, the source database contains exactly one instance of each target PARENT.

The target BLDG-LINK record is probably not valid, however. Given a PEOPLE record, one can locate all the BUILDINGS owned by companies for which the employee works, but it is impossible to distinguish buildings in which the employee actually works from the others owned by the same company. That is, the information to be represented by the BLDG-LINK record

is not represented anywhere in the source database.

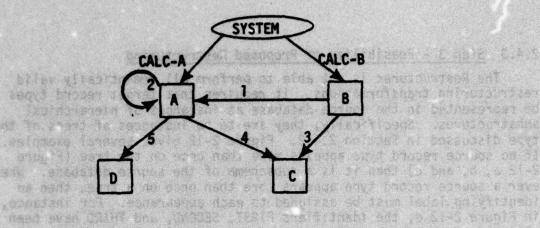
2.4.3 Step 3 - Feasibility of Proposed Restructuring

The Restructurer is not able to perform all semantically valid restructuring transformations. It requires that target record types be represented in the source database as instances of hierarchical substructures. Specifically, they are to be instances of trees of the type discussed in Section 2.4.2. Figure 2-12 gives several examples. If no source record type appears more than once on the tree (Figure 2-12 a, b, and c) then it is a subschema of the source database. Whenever a source record type appears more than once on a tree, then an identifying label must be assigned to each appearance. For instance, in Figure 2-12 d, the identifiers FIRST, SECOND, and THIRD have been attached to the three appearances of record type A on the tree. These identifiers are necessary. An instance of the tree 2-12d consists of an instance of A (the FIRST), the instance of B that owns it along set 1, the instance of A (the SECOND) that owns it along set 2, and the instance of A (the THIRD) that owns the SECOND along set 2. The three instances of A will, in general, be different, and references to them in restructuring specification will have to specify the instance of interest. The identifiers are often conceptual aids, as well, when they describe the role that a source record instance plays in the structure of a target record instance. This is the case with the KID and PARENT identifiers in Figures 2-11 and 2-16. Figures 2-12e and f give additional examples of the use of identifiers.

The Translator places two additional restrictions on the representations of target records in the source database. First, there are three allowable representations for target data items in source trees:

- 1. The item is the same in both source and target.
- 2. The target item is a function of a source item. That is, there must be an algorithm which accepts the source item value as input and produces the target item value as output. The most common examples are data type conversions: a YEAR item might be an integer in the source and a character string in the target, or a PAY-RATE item might be a character string in the source and a floating-point number in the target. A more exotic example might be a CODE-NAME item for which the code has changed, requiring that all Gs be changed to Ts and all Ws to Qs. It should also be observed that this type of representation prohibits multi-item operations such as sum, max, or average.
- 3. The item is a function of the tree itself. That is, the target item has the same value for every instance of the tree in the source RIF. An example of this is shown in Figure 2-15, which will be described shortly.

The second additional restriction requires that the criteria used to separate valid instances of a tree from invalid ones must involve only comparisons between an item on the tree and a constant value or one other item on the tree. Comparisons involving multi-item computations, such as average, are not permitted.



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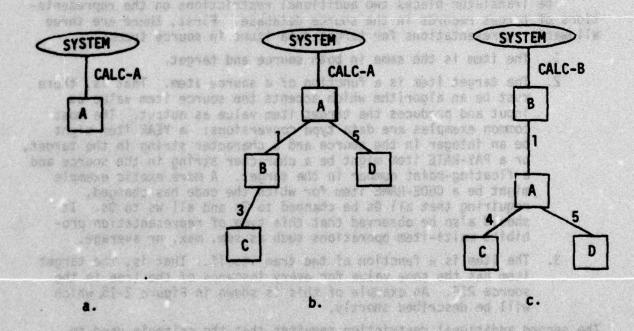
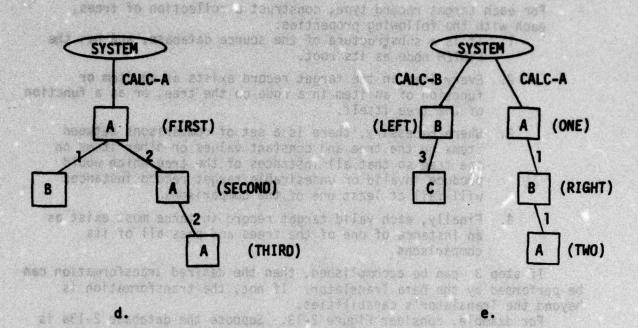


Figure 2-12
Schema and Hierarchical Substructures

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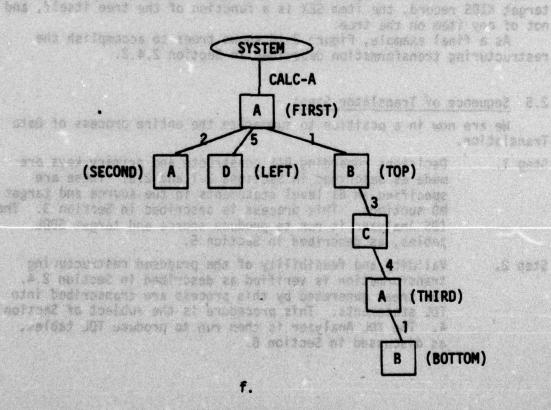


Figure 2-12 (cont'd)
Schema and Hierarchical Substructures

Step 3 may be summarized as follows:

For each target record type, construct a collection of trees, each with the following properties:

1. It is a substructure of the source database, and has the SYSTEM node as its root.

- 2. Every item in the target record exists as an item or function of an item in a node on the tree, or as a function of the tree itself.
 - 3. Where necessary, there is a set of comparisons between items on the tree and constant values or other items on the tree so that all instances of the tree which would produce invalid or undesirable target record instances will fail at least one of the comparisons.
 - 4. Finally, each valid target record instance must exist as an instance of one of the trees and pass all of its comparisons.

If step 3 can be accomplished, then the desired transformation can be performed by the Data Translator. If not, the transformation is

beyond the Translator's capabilities.

For example, consider Figure 2-13. Suppose the database 2-13a is the source, and 2-13b is the target. Then trees, item correspondences, and qualification criteria to accomplish this transformation are shown in Figure 2-14. On the other hand, if we reverse the roles of source and target, then appropriate trees, item correspondences, and qualification criteria are shown in Figure 2-15. Notice that in each tree for the target KIDS record, the item SEX is a function of the tree itself, and not of any item on the tree.

As a final example, Figure 2-16 shows trees to accomplish the

restructuring transformation described in Section 2.4.2.

2.5 Sequence of Translator Steps

We are now in a position to summarize the entire process of Data Translation.

- Step 1. Decisions regarding RIF constructs and primary keys are made as described in Sections 2.1 and 2.3. These are specified in 61 level statements in the source and target MD sections. This process is described in Section 3. The IDS Analyzer is run to produce source and target SDDL tables, as described in Section 5.
- Step 2. Validity and feasibility of the proposed restructuring transformation is verified as described in Section 2.4.

 The trees generated by this process are transcribed into TDL statements. This procedure is the subject of Section 4. The TDL Analyzer is then run to produce TDL tables, as discussed in Section 6.

- Step 3. The Reader creates the source RIF. Its use is described in Section 7.
- Step 4. The Restructurer creates the target RIF. Running the Restructurer is discussed in Section 8.
- Step 5. The Writer creates the user's target database, as described in Section 9.

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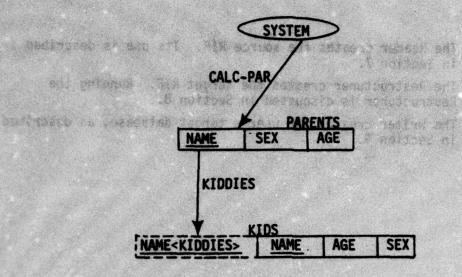
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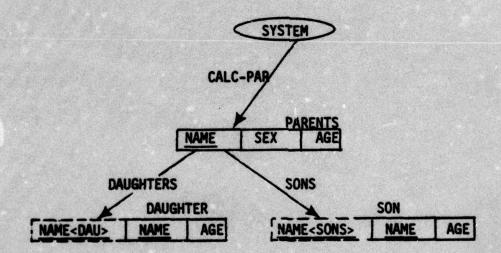
BARLO INC

Step 3.

Step 5.

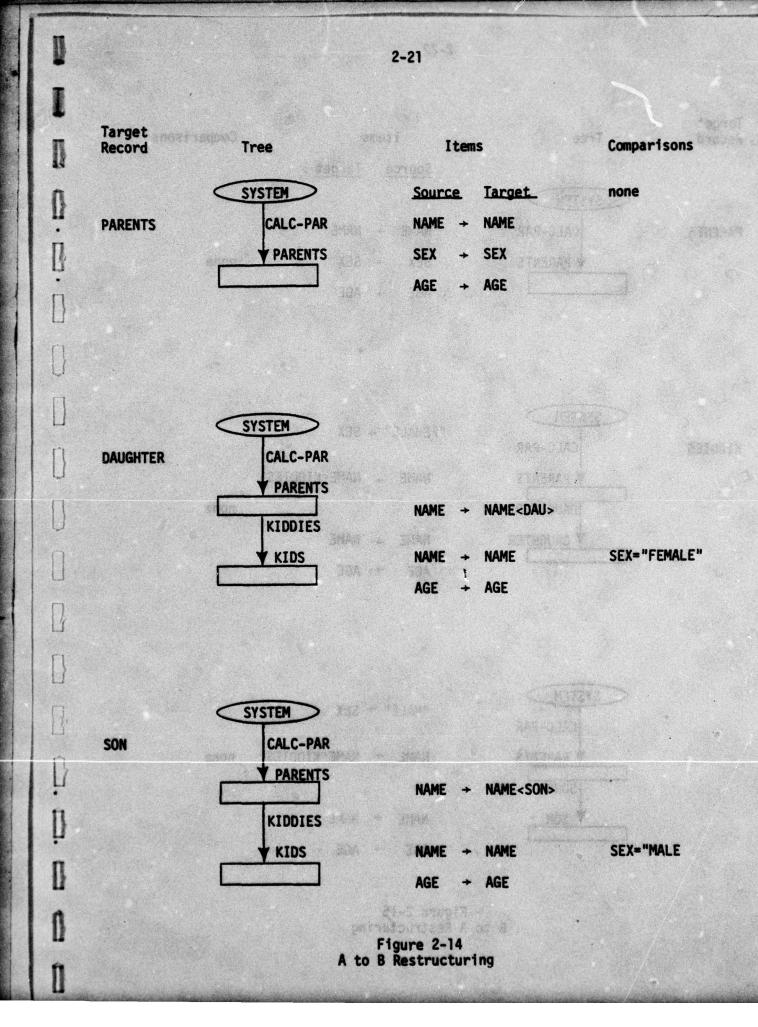


a. A Database



b. A Related Database

Figure 2-13



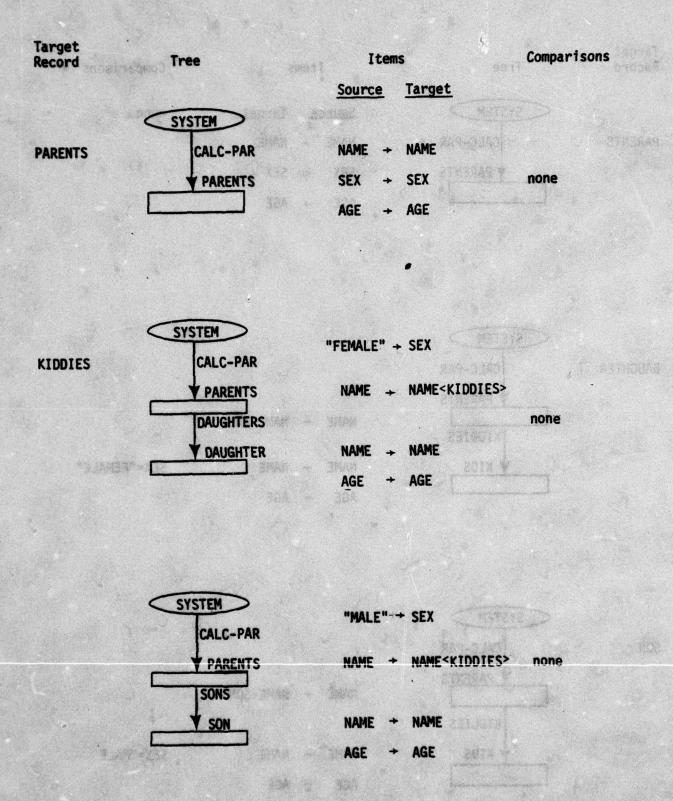
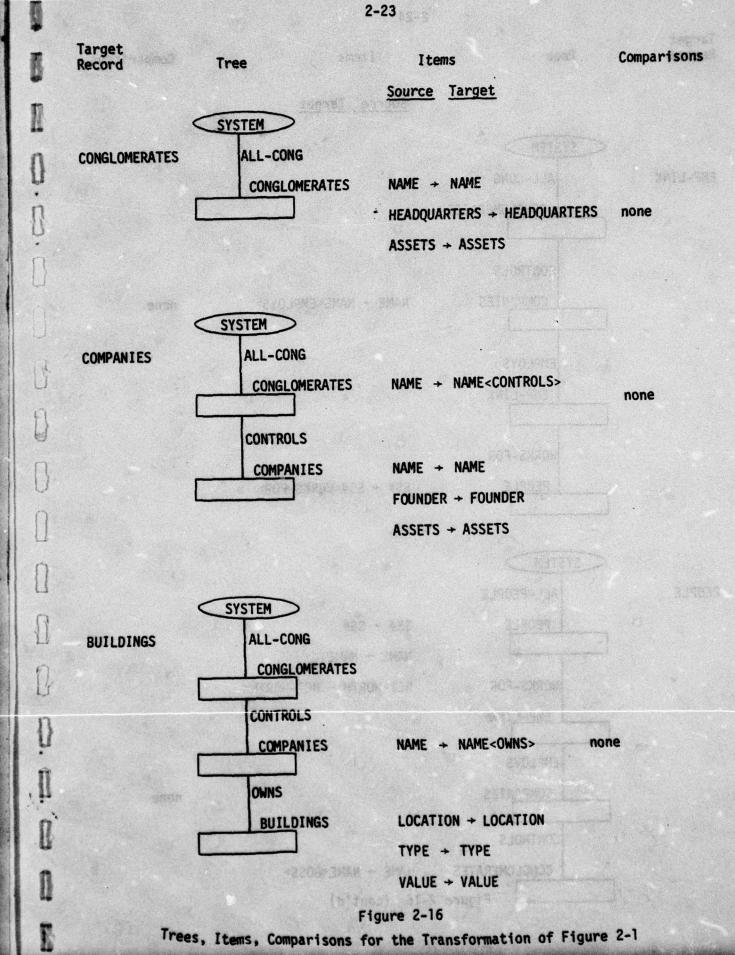
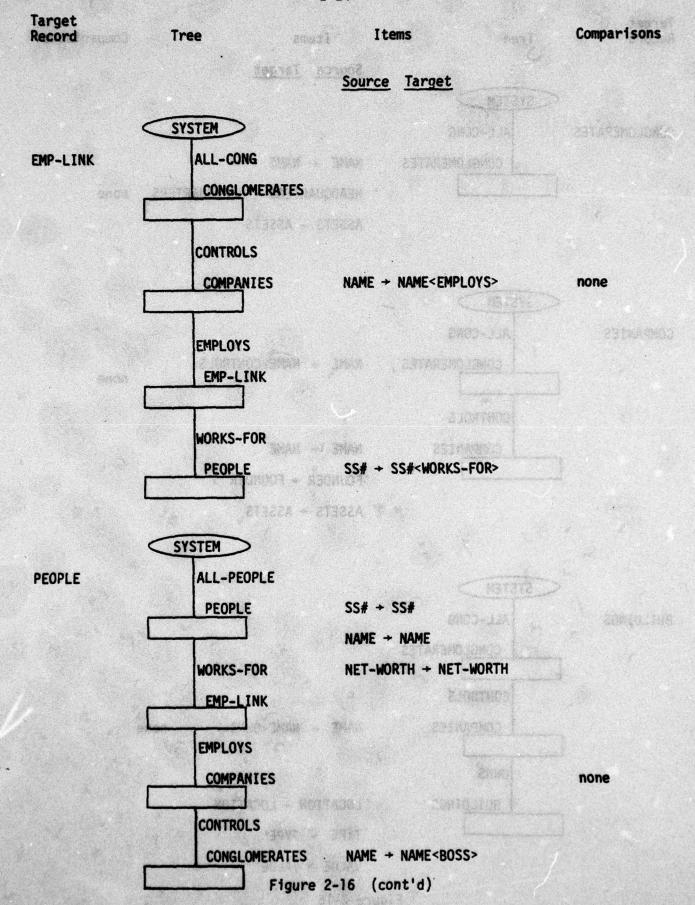


Figure 2-15 B to A Restructuring

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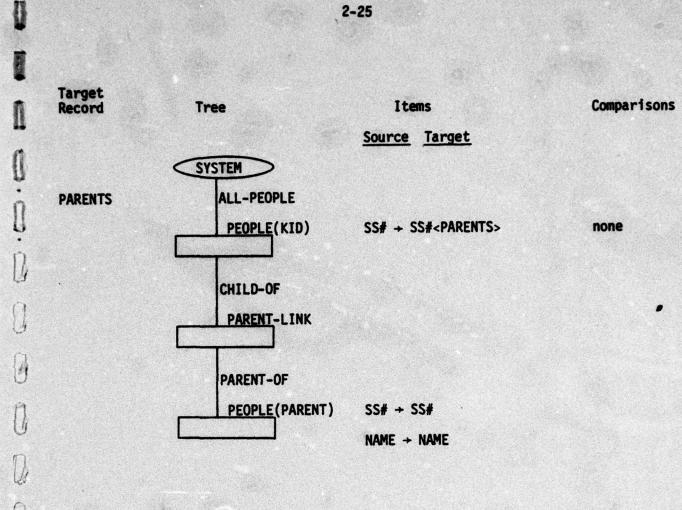


Figure 2-16 (cont'd)

3.0 AUGMENTING THE IDS MD WITH LEVEL 61 INFORMATION

In order to perform data translation between a source database and a target database, it is necessary to describe to the Translator the characteristics of the databases. Each of the Translator modules requires specific information about the data upon which it is executing. As designed, the Translator is table-driven in its execution. That is, from a description of the source and target databases, and guides for transforming source into target, the Translator can restructure almost any sequential, ISP or IDS database into a new IDS database. What the user must provide to the Translator is the aforementioned descriptions. This section outlines the rules for describing the source and target database.

The basis for the database description is an IDS MD section. This is true even if the source database(s) to be described is of the sequential or ISP type. For source IDS databases, the IDS MD already exists, whereas for source sequential and ISP databases, as well as the target IDS database, an IDS MD must be prepared. The user is referred to the IDS Programmer's

Guide for aid in preparation of the MD section.

Once the MD sections have been written, it is necessary to extend them to explicitly provide information to the Translator that is otherwise unobtainable. Specifically, the IDS MD does not:

- 1. Identify a record's primary keys which must be known by the Restructurer.
- 2. Identify where in the database schema entry can be made (location of the tops of the database).
- 3. Identify unusual relations implemented without the use of IDS chains. For example, phantom pointers must be explicitly declared.
- 4. Identify ISP and sequential record identifiers that are required under the WWDMS B-3, T-1 and T-2 implementations.

In addition to the above, the user must restate some information that appears already to be in the IDS MD. This restatement is required because of the algorithm used by the Translator to get information from the MD to its internal data description tables (SDDL tables). Section 3.! details the process of extending the IDS MD.

Definition

3.1 Process of Extending the IDS MD Section

To understand the rationale for extending the IDS MD it is necessary to be aware of the implementation of the IDS Analyzer. Briefly, the IDS MD section with extensions is passed to the IDS Translator (the Honeywell compiler) which is run in query mode. The resultant output is the IDS Query dictionary whose format is known. Using the IDS Query dictionary as input, the IDS Analyzer produces SDDL tables. The user is referred to the IDS Data Query Installation Guide for a complete description of the layout of the Query dictionary. It can be seen from the diagram of the dictionary schema in that document that information above and beyond the normal 01, 02 and 98 level entries of an MD section can be stored within the Validation and Description records. Figure 3-1 is an overview of the MD extension process.

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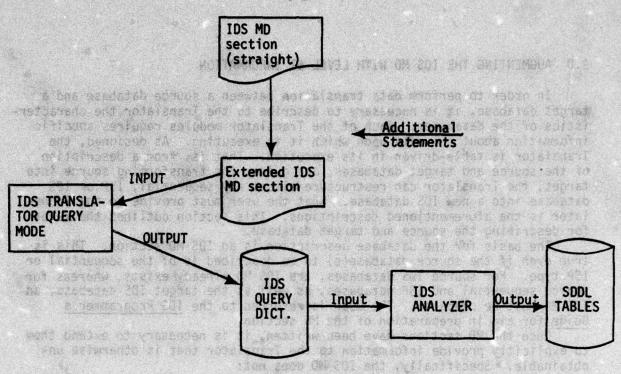
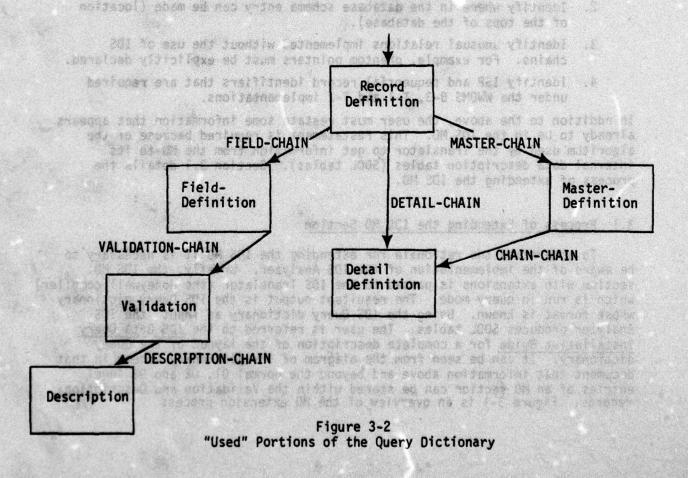


Figure 3-1
Extension of an IDS MD



Refer to Figure 3-2 to further examine the algorithm of conversion between MD section and SDDL tables. The diagram is a subset of the entire Query dictionary schema. Only the actual records used by the IDS Analyzer are indicated. The table below shows how information required in the SDDL tables is derived from the Query dictionary.

SDDL table information

Derivable from which Query dictionary records

- Names and attributes of 01 1. Record definition records
- 2. Names and attributes of non-01 2. Validation and description records, e.g., contained-inrepeating groups
- Names and attributes of 02 3. Field definition fields
- fields
 - Names and attributes of 03-49 4. Validation and description
- 5. Primary key information
- 5. Description
- Match-key and phantom pointer 6. Description relations
- Record identifiers for sequen- 7. Description tial and ISP files vides big:
- 8. Relations implemented through
 - 8. Master definition and detail definition The Literal
- ISP and Sequential file relations
- 9. Master definition and detail definition.

As can be seen from the above table, obtaining information from only the Record definition, Field definition, Master definition and Detail definition records is insufficient to provide all the data to the SDDL tables. Validation records are automatically created by the IDS Translator in query mode for all 02-49 entries. The user, therefore, need not be concerned with explicit creation of these records. However, to create a description record, the user must code a level 61 entry in the IDS MD. Level 61 entries form the basis of all extensions to the MD section.

When coding level 61 entries, they must be placed within the MD section in accordance with the rules defined by the IDS Translator in query mode and the IDS Analyzer. Complete syntactical rules are given in Section 3.2. In general, an extended MD section will look like Figure 3-3. Level 61 entries are coded beneath the 02-49 field or group entry to which they apply.

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- mailtans and the documents as 01 record entry and 1902 one record of memorial the used in the TTE family for
- Cast Cambrida Actions and Artecl • 02 field entry

Refer to Figure 3-2 to further measure and the average of Figure 3.

- 02 field entry
- yespertant was restaurable and a day 02 group entry
 - 03 group entry
 - 61 extension 04 field entry 04 field entry

-mattements: west weather

48 Safer of A Talkanopel ban 921

61 extension

- 02 field entry
- 61 extension
 - 61 extension
- 10830 Thouse bus not 180 61 extension 30 No Regularitie bus same
 - 61 extension
 - 98 chain entry
 - 98 chain entry
 - 01 record entry

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- 02 field entry
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 - 02 field entry

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3.1.1 Further Rationale for Level 61 Entries

As the user reads further into this section, it is probable that he will feel that restructuring operations are being specified on the source database by denoting contained-in-repeating groups, phantom pointers and match-key relations. In a sense, it is true but these specifications must be performed at database description time (i.e., writing level 61s), otherwise the Restructurer, when executed, will not be aware of the non-IDS constructs that the user wishes to preserve. Consider it from the following perspective. The Restructurer uses as input not the source database, but a database produced by the Reader in which

- all contained-in-repeating groups in the source user database are now full-fledged groups in the source Restructurer database (Source RIF).
- all match-key and phantom pointer relations in the source user database are represented as legitimate sets in the Source RIF.

If the information represented by contained-in-repeating groups, phantom pointers and match-key relations is to be used at all in the construction of the target database, it must be identified by writing level 61 entries.

3.1.2 Summary of Required Extensions

Level 61 entries must be prepared for the following elements of a database.

- 1. All groups must have their primary keys identified.
 - 2. All contained-in-repeating groups must be denoted.
 - Any match-key or phantom relations must be identified if the user desires the information represented in those relations to be preserved.
 - 4. ISP and Sequential databases must have an item identified within each record type as the item containing the record ID.
 - 5. Items whose usage is DISPLAY-1 or DISPLAY-2 must be identified.

Sale endulate and Tible somethic of

Repeating groups that are to be ignored as groups must be identified.

3.2 Level 61 Rules

Before coding any extensions to the IDS MD section, certain rules and restrictions placed both by the IDS Analyzer and IDS Translator in query mode must be rigidly obeyed. These rules can be broken down into three categories - global rules pertaining to the IDS MD section, global rules pertaining to level 61 entries, and rules concerning automatic generation of names by the IDS Analyzer. These rules are described below.

3.2.1 Global MD Section Rules

- 1. Before making any extensions, the 103 mb section process the MD be legal and error-free. It is a good idea to process the MD company mode and by company mode and by company mode and by company mode. Before making any extensions, the IDS MD section prepared must section by the IDS Translator (not in query mode) and by COBOL to determine if it is indeed syntactically and semantically correct. A dummy COBOL-IDS program with a PROCEDURE-DIVISION of only a STOP RUN is ideal for this purpose. PA T
- 2. All non-elementary item entries within the MD section must have a SIZE clause on them. For example, the MD section on the left below must be changed to the MD section on the right.

04 ITEM-1 PIC XX. 04 ITEM-1 PIC XX.

completely and another in the fource westmusturer authors (Sounce)

04 ITEM-2 PIC XX.

02 ITEM-NAME PIC XX.

refer rearrow moderne be 02 GROUP-NAME. 02 GROUP-NAME SIZE 4.

03 SUB-GROUP-NAME. 03 SUB-GROUP-NAME SIZE 4.

04 ITEM-2 PIC XX.

02 ITEM-NAME PIC XX.

prepared for the following ele To compute the size of a group in COBOL use the following rules.

- a. Single-precision computational items require preceding slack characters so that they start on a fullword boundary.
- Double-precision computational items require preceding slack characters so that they start on a doubleword ose relations to boundary.
- c. Non-computational items never require preceding slack
 - d. If the first item of the group is a computational item, then any required preceding slack characters are not counted as part of the size of the group.
 - e. The number of slack characters at the end of group occurrence is (if the group has an OCCURS clause):

the zeros of the condition of the second second

- i) group has no computational zero 38760 030 items within it
- ii) group has at least one singleprecision computational but no double-precision computational items

number of slack characters at end of group

However many slack characters needed such that the size of one occurrence of the group is evenly divisible by 6

iii) group has at least one doubleprecision computational item

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a length gradier than 200 energees.

However many slack characters needed such that the size of one occurrence of the group is evenly divisible by 12.

- f. All records are assumed to start on a doubleword boundary.
 - 3. If an OCCURS and a SIZE clause are coded on the same entry, the OCCURS clause must come first.

RIGHT

WRONG

03 GROUP-NAME OCCURS 2 TIMES SIZE 18.

03 GROUP-NAME SIZE 18
OCCURS 2 TIMES.

4. If a PICTURE and an OCCURS clause are coded on the same entry, the PICTURE clause must precede the OCCURS clause.

RIGHT

WRONG

O3 REPEATING-ITEM PIC X(5)
OCCURS 3 TIMES.

O3 REPEATING-ITEM OCCURS 3 TIMES PIC X(5).

Note that "5" is the length (size) of one occurrence of REPEATING-ITEM.

5. A PICTURE and a SIZE clause cannot be coded on the same entry.

U 0.80 TZ

WRONG

- 03 REPEATING-ITEM PIC X(6) OCCURS 2 TIMES SIZE 12.
- 6. It is highly advisable to ensure that within one MD section all item (level 03-49), record and chain names are unique. This is more restrictive than absolutely necessary, but if non-unique item names are present, the IDS Translator in query mode will append a letter to the end of the name to make it unique. This adds an unnecessary level of indirection between the user's names and those names used by the Data Translator.

NOT RECOMMENDED

RECOMMENDED

02 FIRST-GROUP SIZE 10.

03 ITEM-1 PIC XX.

03 ITEM-2 PIC X(8).

02 SECOND-GROUP SIZE 5.

03 ITEM-1 PIC XXX.

03 ITEM-2 PIC XX.

02 FIRST-GROUP SIZE 10.

03 ITEM-1-FG PIC XX.

03 ITEM-2-FG PIC X(8).

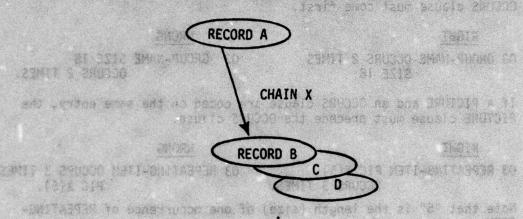
02 SECOND-GROUP SIZE 5.

03 ITEM-1-SG PIC XXX.

03 ITEM-2-SG PIC XX.

7. Every 01 record must have as one of its 02 fields an entry exactly like: "02 TRANSLATION-INFORMATION SIZE 0", or abbreviated: "02 T-I SIZE 0". Beneath this 02 entry will be all primary key and relation information that must be added to the IDS MD section.

- tit onough this at least one couple- However copy stack characters 8. No group may have more than sixty items defined for it.
- 21 OUCTE 19. No item may be of a length greater than 255 characters.
 - No more than twenty records may be details on a given chain, e.g., if record A is the master of chain X as shown, only up to twenty record types may be a detail on that chain. Note that this rule applies to record types, not instances.



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It is highly advisable to ensure that within one HD section all

STIMES SIZE 12.

is A Figital and a SIZE clause court is comed on the East entry.

- 11. Ninety five (95) record types and five (5) databases are the maximum allowable in any one extended IDS MD section (see Section 3.8).
 - 12. User names may not be TDL reserved words. This is due to the parsing restrictions of the TDL Analyzer. The reserved word list includes:

1 400

ACCEPT	ID	OWNER/MEMBER
ACCESS	iF	QUALIFIED
ACTUAL	IN	RECORD
ALL	IS	RESECT
ARE	LE WAR	SELECT
AS	LITERALLY	SET
ASSIGN	LT	SIGNIFICANT
BY	MACRO	SOURCE
CONVERT	MEMBER/OWNER	TARGET
DATA	NAME	TDLAP
EOF	NAMES	TO
EQ	NE	VALUE
FROM	NULL	VIA
GE	ORDER	WHEN
GT OF THE S	OTHER	WITH TO SEE

3.2.2 Global Level 61 Rules

- 1. A level 61 entry must be coded beneath 02-49 entries only. general they are coded directly beneath the item or group that they are intended to extend.
 - 2. A level 61 entry is of the form "61 text" where the "61" may start no further left than column 12; the text cannot extend past column 72.
- 3. There must be at least one intervening blank between "61" and HILLS TO T the text. Datemence
 - 4. The maximum length of any 61 level text is 24 characters. Blanks preceding the beginning of the text are not counted in the 24 character limit but trailing blanks are. Essentially, this makes every 61 level entry contain exactly 24 characters. If the user needs to code a name that is greater than 24 characters, two 61 level entries are required, such as:

24th character

Limite Start to tradition

- 61 ITEM-NAME-THAT-IS-EXTREM
- berries and 61 ELY
 - 5. The maximum length of any user name, group, item or relation is 30 characters.
 - 6. A comma "," cannot be the first character of a level 61 entry.

NOT ALLOWED

61 , text

- 7. When processing the description record image of a level 61 entry, spaces (blanks) are ignored by the IDS Analyzer. Of course user names cannot have intervening spaces within them. This means that if a user name is to be split over two level 61 lines, the first line must contain exactly 24 characters of text.
- The legal character set that can be coded within a level 61 entry is any COBOL character with the exception of "+".

3.2.3 IDS Analyzer Automatically-Generated Names

For a variety of implementation reasons, some of which are too complex for this document, item or chain names as specified within the extended IDS MD section are altered by the IDS Analyzer. Similarly, it is necessary to create names for items and relations so that certain information (which is not supplied by the user...a convenience feature) is identified. As an example of the former case, chains which have multiple detail record types (for example: chain-"HAS-CHILDREN" with "SONS" and "DAUGHTERS" as the detail record types) are transformed into multiple chains, each with one detail record type with the new chain names being slight extensions to the original (see rule #1). In the second case above, the relation between a group and a contained-in-repeating group is never explicitly declared by the user but is instead generated by the IDS Analyzer (see rule #3).

In general, the user must be aware of how the IDS Analyzer will alter, adjust, or create names. If the user wishes to refer to a name within a level 61 entry, the actual character-string to use must be the IDS Analyzer altered or created name. The examples following this section will make this clear.

- 1. IDS allows multiple detail record types per chain type. This implies that one relation name is used from the master record to all of its detail record types on a particular chain type. However, the Data Translator requires that each (master record, detail record) tuple that is related have a unique relation name. This necessitates slight modification to the chain name according to the following rule:
 - a) The chain name from the master record to its detail record types is appended with the characters "/char" where "char" is a number 1-9, or a letter A-K.
 - b) If the chain name is greater than 28 characters only the first 28 characters are used.
 - c) The assignment of the tack on "/char" value is based on reading the IDS MD section top to bottom, e.g., the first 98 DETAIL entry for that chain will be "/l", the second will be "/2", etc.

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Example

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01 REC-1 ...

98 SUPER-CHAIN CHAIN MASTER CHAIN-ORDER IS AFTER.

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Ol REC-2 ... Proper proper party sych format general

98 SUPER-CHAIN CHAIN DETAIL SELECT CURRENT MASTER.

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01 REC-3 ...

98 SUPER-CHAIN CHAIN DETAIL SELECT CURRENT MASTER.

Will generate the following two relation names:

RELATION	MASTER DETAIL
SUPER-CHAIN/1	REC-1 REC-2
SUPER-CHAIN/2	REC-1 REC-3

 If a repeating item is to be expanded out of its containing record, then the resultant group name is the name of the original item, and the sole item of the new group has as its name one of the following:

- a) The original item name appended with "/IT".
- b) The first 27 characters of the original item name appended with "/IT" if the original name was longer than 27 characters.

Example

Suppose the MD section is as follows:

01 RECORD-1 TYPE IS 1 RETRIEVAL VIA ...

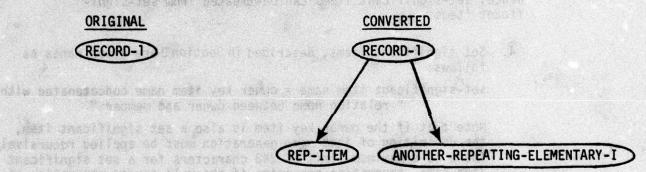
02 GROUP-NAME SIZE 40.

03 REP-ITEM PIC X(5) OCCURS 4 TIMES.

03 ANOTHER-REPEATING-ELEMENTARY-I PIC X (10) OCCURS 2 TIMES.

02 ...

If both of the 03 entries are to be considered as contained-inrepeating groups, then the IDS Analyzer will convert the schema represented by the above as follows:



The groups each will have a single item named as follows:

GROUP	ITEM NAME	LENGTH OF ITEM
REP-ITEM	REP-ITEM/IT	7 9700405
ANOTHER-REPEATING-	ANOTHER-REPEATING	10

Note that RECORD-1 will no longer contain within it the 40 characters of GROUP-NAME. The relation between RECORD-1 and its new dependent groups is given a name according to rule 3 below.

3. Since all relations must have names, the relations between a group (record) and its contained-in-repeating groups (termed a concatenated relation) must be given names by the IDS Analyzer. The rule for construction of such names is as follows:

relation = the lesser of (the containing group and its first 12 characters) concatenated with "/OWNS/" concatenated with the lesser of (the contained-in-repeating group name and its first 12 characters)

Example

Using the names from the preceding example, the relation names that are assigned between RECORD-1 and its contained-in-repeating groups are:

RELATION

RELATION-NAME

Between RECORD-1 and REP-ITEM

RECORD-1/OWNS/REP-ITEM

Between RECORD-1 and ANOTHER-REPEATING-ELEMENTARY-I

RECORD-1/OWNS/ANOTHER-REPE

In Section 2 of this User Manual, the augmented Bachman diagram was introduced and explained. Since these diagrams are notable for their inclusion of set-significant items, it is necessary to identify and describe to the Data Translator their presence. However, all set-significant items are automatically created by the IDS Analyzer. To briefly review:

A set-significant item for a member (detail) record type X is created for every primary key item in every owner (master) record type for which X is a member (detail). Note that set-significant items may be primary key items and hence, set-significant items can be created from set-significant items.

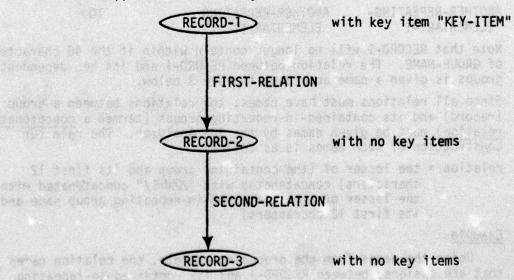
4. Set significant items, described in Section 2 are given names as follows:

set-significant item name = owner key item name concatenated with
 "<relation name between owner and member>"

Note that if the owner key item is also a set significant item, the definition of item name generation must be applied recursively. There is a maximum limit of 240 characters for a set significant item name, truncation occurring if the rule causes generation of length greater than 240.

Example

Suppose the following schema exists:



Primary keys for RECORD-2 must come from RECORD-1 and primary keys for RECORD-3 must come from RECORD-2. The keys for these records (which will be set-significant items) will have the following names. use said victor bearings

English

DIFFORM

RECORD NAME OF SET-SIGNIFICANT ITEM (ALSO A KEY)

RECORD-2

KEY-ITEM<FIRST-RELATION>

RECORD-3 KEY-ITEM<FIRST-RELATION><SECOND-RELATION>

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1. at MCDMS integer TIMES. OF CO-MOT-RESTRUCTURE.

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System entry points must be identified for the Data Translator. A system entry point is defined as that record which can be considered a detail of a record thought of as "SYSTEM". The relation between the "SYSTEM" and the system entry point record is named according to the following rules.

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Inte section details the correct typing for all feathree of the light Anterna D.C. Smellast at nevig era permusa Les aeles selles selles la lastaine la 3.5. Standard biscott, beads, double-box and pillests agreement .5.5 which are captained at the commence of the property of a strong way med mentyage are controlled about no new service is level purbus contain key words. These storegrations ask tendent of equipment

characters, for impuble, Thefault as objects as the states at the sales of the course, cold, sounded and and action of the cold and the sales of the cold and the served withto the Contac edies. Each seement level it copes for Anticol

- a) only CALC and PRIMARY records are defined to be system entry points.
 - b) the relation name is either

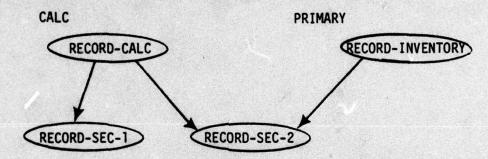
"CALC-" concatenated with the system entry point record name (up to 25 characters) if record is CALC

Hor Cor

"PRIM-" concatenated with the system entry point record name (up to 25 characters) if record is PRIMARY

Example

ok to this point business in the areas is from the ender Assume the following schema:



System entry point relations will be generated with names: CALC-RECORD-CALC PRIM-RECORD-INVENTORY and

3.2.4 Complete Level 61 Syntax

This section details the correct syntax for all features of the level 61 entries. Specific rules and examples are given in Sectiond 3.3 through Standard bracket, brace, double-bar and ellipsis notation is used. Key words are capitalized; generic user-names are in lower case. Because coding level 61 entries can be tedious, abbreviations are provided for certain key words. These abbreviations are denoted by underscored characters. For example, "PARENT" can be abbreviated as "PA". Strict attention should be paid to the use of the comma, colon, semi-colon and period within the syntax rules. Each separate level 61 entry (or entity) is denoted by a roman numeral.

Group definition

- 61 OCCURS integer TIMES.
- 61 DO-NOT-RESTRUCTURE.
- III. 61 EOG.

```
16-edan-cobra 11/4024 :
  Item definition
   I. 61 ITEM-INFORMATION.
   II. [6] PAD-CHARACTER: 'character']
  III. \begin{bmatrix} 61 & \underline{DISPLAY} : \begin{pmatrix} 1 \\ 2 \end{pmatrix} \end{bmatrix}
                            A-graph-montp 1 to 1/10/3930
                        CERS TEEN-MADERAL (Tambahasa)
  Primary-key definition
         02 TRANSLATION-INFORMATION SIZE O.
                                 61. (15.8-14/00/MA-110M)
         61 PRIMARY-KEYS.
          61 GROUP: group-name-1,
         61 ITEMS: item-name-1 [,item-name-2]...
             EXTERNAL-KEYS-FROM: relation-name-1 [,relation-name-2]...
             when the stay of sicrement in the profession of the stay of the stay of the
                               word when to evice of the bold water b
             GROUP: group-name-2,
cavite:
       61 ITEMS: item-name-1 [,item-name-2]...
            EXTERNAL-KEYS-FROM: relation-name-1 [,relation-name-2]...
  Relation-definition
         02 TRANSLATION-INFORMATION SIZE O.
          61 PHANTOM-POINTERS.
                                    integer must be a positi
          61 RELATION: relation-name-1,
                                     integer must be ever
             DEPENDENT: group-name-1,
         61 POINTER: item-name-1
                                        Every DCDIES class
         61 ; RELATION: relation-name-2,
              DEPENDENT: group-name-2,
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         61
                                        na /www.p-labbe,
               POINTER: item-name-2
         61
             and worlded viscomerans seems 12075000234-108-08 IP
         02 TRANSLATION-INFORMATION SIZE O.
   II.
         61 MATCH-KEY-RELATIONS.
 781533 10
                                 clause need not be coled
          61 PARENT: group-name-1
         61 KEYS: item-name-1 [,item-name-2]...;
  61 RELATION: relation-name-1,
         61 <u>D</u>EPENDENT: group-name-2,
  61 KEYS: item-name-3 [,item-name-4]...
```

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61	; PARENT: group-name-3,
61	KEYS: item-name-5 [,item-name-6];
61	RELATION: relation-name-2,
61	DEPENDENT: group-name-4,
61	KEYS: item-name-7 [,item-name-8]

Sequential, ISP files

61 ITEM-INFORMATION.

61 IDENT: 'character-string'

3.3 Group definition

Within any 01 record, it is possible to have not only items, but also groups. Identification of these groups and an indication whether or not the group is to be considered a contained-in-repeating group must be given to the IDS Analyzer. Use of the following level 61 entries provides this information.

- 61 OCCURS integer TIMES.
- 61 EOG.
- 61 DO-NOT-RESTRUCTURE.

Rules:

- 1. Integer must be a positive integer.
- Integer must be exactly equal to the COBOL OCCURS integer TIMES on the immediately preceding 02-49 entry.
- 3. Every OCCURS clause coded on a 02-49 entry must have a matching 61 OCCURS integer TIMES entry directly following.
- Every 61 OCCURS integer TIMES entry must be matched by a 61 EOG (end-of-group) entry to be placed after the last item of the group.

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- If the group is not to be a contained-in-repeating group, then
 DO-NOT-RESTRUCTURE must immediately follow the 61 OCCURS integer TIMES entry.
- For groups whose number of occurrences is one, the COBOL OCCURS clause need not be coded. Three choices are available to the user.
 - a) Code a 61 OCCURS 1 TIMES 61 EOG. combination after the group entry and after the last item entry within the group. This will cause the group to become a contained-in-repeating group.
 - b) Code a 61 DO-NOT-RESTRUCTURE after the group entry. This will cause the IDS Analyzer to treat the group as a single item made up of the concatenation of all of its subordinate entries.

- c) Do nothing. The IDS Analyzer will treat all subordinate entries as items at the same hierarchical level as the group. The concept of a group is ignored.
- 7. Contained-in-repeating groups may be defined for source databases only.
 - 8. Only one level of nesting of contained-in-repeating groups is allowed. Contained-in-repeating groups cannot contain their own contained-in-repeating groups.

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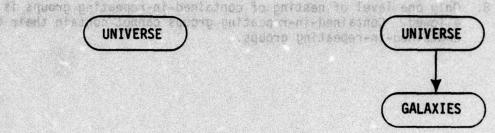
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[Group definition] The second of the second

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Original Schema Desired Translator-viewed Schema

UNIVERSE



Original MD Section

O1 UNIVERSE TYPE IS 1 ...

02 UNIVERSE-NAME PIC X(10).

02 CONTENTS SIZE 80.

03 GALAXIES OCCURS 5 TIMES SIZE 80.

04 GALAXY-NAME PIC X(10).

04 GALAXY-SIZE PIC 9(6)

02 INHABITED-BY PIC X(10).

Required Extended MD Section

O1 UNIVERSE TYPE IS 1 ...

02 UNIVERSE-NAME PIC X(10).

02 CONTENTS SIZE 80.

03 GALAXIES OCCURS 5 TIMES SIZE 80.

61 OCCURS 5 TIMES.

04 GALAXY-NAME PIC X(10).

04 GALAXY-SIZE PIC 9(6).

61 EOG.

02 INHABITED-BY PIC X(10).

This example illustrates the simple expansion of one contained-inrepeating group from its contained-in group. Note that all groups have a SIZE clause on their entry. The 61 OCCURS 5 TIMES is placed immediately below the COBOL OCCURS clause while the 61 EOG. is placed after the last item of the group.

Because a contained-in-repeating group was defined, a relation name must be generated between UNIVERSE and GALAXIES. Rule 3 in Section 3.2.3 states that the relation name will be "UNIVERSE/OWNS/GALAXIES". As far as the Data Translator is concerned, UNIVERSE will not have any galaxy data within its record.

[Group definition]

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Original Schema

UNIVERSE

Desired Translator-viewed Schema

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UNIVERSE

Original MD Section

OI UNIVERSE TYPE IS 1 ...

02 UNIVERSE-NAME PIC X(10).

02 CONTENTS SIZE 80.

03 GALAXIES OCCURS 5 TIMES SIZE 80.

04 GALAXY-NAME PIC X(10).

04 GALAXY-SIZE PIC 9(6).

02 INHABITANTS PIC X(10)

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Required Extended MD Section

OI UNIVERSE TYPE IS 1 ...

02 UNIVERSE-NAME PIC X(10).

02 CONTENTS SIZE 80.

03 GALAXIES OCCURS 5 TIMES SIZE 80.

61 OCCURS 5 TIMES.

61 DO-NOT-RESTRUCTURE.

04 GALAXY-NAME PIC X(10).

04 GALAXY-SIZE PIC 9(6).

61 EOG.

02 INHABITANTS PIC X(10).

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In this example, GALAXIES plays no part in the restructuring to the target database so a contained-in-repeating group is not desired. As before, the 61 OCCURS - 61 EOG. combination must be coded because a COBOL OCCURS clause is present. The 61 DO-NOT-RESTRUCTURE is placed immediately after the 61 OCCURS to indicate to the IDS Analyzer that GALAXIES is not a contained-in-repeating group but is to be treated as a single, elementary, item of alphanumeric type with a length of 80 characters.

172-374 (20) 357-738 (36)

[Group definition]

Original Schema

ROCK-STARS

Original MD Section

OI ROCK-STARS TYPE IS 20 ...

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02 STARS-NAME PIC X(20).

02 BANDS SIZE 100.

03 BANDS-PLAYED-IN PIC X(20)

OCCURS 5 TIMES.

02 FAVORITE-GROUPIE SIZE 11.

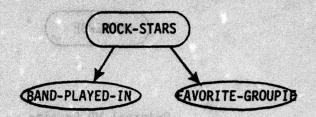
03 GROUPIE-NAME PIC X(10).

901 10

03 GROUPIE-SEX PIC X.

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Desired Translator-viewed Schema



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Required Extended MD Section

01 ROCK-STARS TYPE IS 20 ...

02 STARS-NAME PIC X(20).

02 BANDS SIZE 100.

03 BANDS-PLAYED-IN PIC X(20)

OCCURS 5 TIMES.

61 OCCURS 5 TIMES.

61 EOG.

02 FAVORITE-GROUPIE SIZE 11.

61 OCCURS 1 TIMES.

03 GROUPIE-NAME PIC X(10).

03 GROUPIE-SEX PIC X.

ext of entragachates with at they be easily 11 61 EOG a passa zint at

This example illustrates two additional methods of identifying contained-in-repeating groups. BANDS-PLAYED-IN is a repeating item. FAVORITE-GROUPIE is a group that occurs only once. Note that for repeating items, the 61 OCCURS - 61 EOG. combination is placed directly beneath the repeating item entry. Upon completion of this coding, the IDS Analyzer will create the following:

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GROUP

ITEMS

ROCK-STARS

STARS-NAME

BANDS-PLAYED-IN

BANDS-PLAYED-IN/IT (see rule 2 in Section 3.2.3)

FAVORITE-GROUPIE

GROUPIE-NAME, GROUPIE-SEX

RELATIONS

ROCK-STARS/OWNS/BANDS-PLAYED

ROCK-STARS/OWNS/FAVORITE-GRO

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[Group definition]

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ROCK-STARS

Original Schema Desired Translator-viewed Schema

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ROCK-STARS

Original MD Section

01 ROCK-STARS TYPE IS 20 ...

02 STARS-NAME PIC X(20).

02 BANDS SIZE 100.

03 BANDS-PLAYED-IN PIC X(20) 61 DO-NOT-RESTRUCTURE. 02 FAVORITE-GROUPIE SIZE 11.

03 BANDS-PLAYED-IN PIC X(20)
OCCUPS 5

03 GROUPIE-NAME PIC X(10).

O3 GROUPIE-SEX PIC X. 61 EOG.

Required Extended MD Section

OI ROCK-STARS TYPE IS 20 ...

02 STARS-NAME PIC X(20).

02 BANDS SIZE 100.

OCCURS 5 TIMES.

61 OCCURS 5 TIMES.

02 FAVORITE-GROUPIE SIZE 11.

03 GROUPIE-NAME PIC X(10).

93 STOUPIE-SEX PIC X.

This example illustrates the suppression of potential contained-inrepeating groups. Note however, that the 61 OCCURS - EOG. combination is required even though BANDS-PLAYED-IN will not become a group. Upon processing the extended MD section the IDS Analyzer will create the following:

GROUP

ROCK-STARS

ITEMS

STARS-NAME, BANDS, GROUPIE-NAME, GROUPIE-SEX

3.4 Item Definition

Two special item attributes must be explicitly described to the Data Translator via the IDS Analyzer. This information is unavailable through normal means within the Query dictionary and hence must be coded on level 61 entries.

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61 ITEM-INFORMATION.

[61 PAD-CHARACTER: 'character']

61 <u>DIS</u>PLAY: (1)

Rules:

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- 1. Character is any one character in the BCD set.
- ITEM-INFORMATION followed optionally by PAD-CHARACTER and DISPLAY must be coded directly beneath the COBOL elementary item for which the special attributes apply.
- 3. PAD-CHARACTER: 'character' clause is used if the leading or trailing fill characters of the COBOL item are not the default blank for alphanumeric and zero for computational.
- 4. DISPLAY: $\begin{Bmatrix} 1 \\ 2 \end{Bmatrix}$ is used if

118-51 0000 38A4-2198082 20180 38A72

- a) the COBOL elementary item has USAGE DISPLAY-1 in which case DISPLAY:1 is coded
- b) the COBOL elementary item has USAGE DISPLAY-2 in which case DISPLAY:2 is coded.

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[Item definition]

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INVENTORY

Original Schema Desired Translator-viewed Schema

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INVENTORY

Original MD Section

O1 INVENTORY TYPE IS 1 ... O1 INVENTORY TYPE IS 1 ...

02 PART-NAME PIC X(10) USAGE DISPLAY-2.

02 PART-NUM PIC 9(8) USAGE DISPLAY-1. 61 ITEM-INFORMATION.

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02 PART-PRICE PIC 9(6) COMP-1.

Additional information

The characters before the first digit in PART-PRICE are always asterisks

Required Extended MD Section

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02 PART-NAME PIC X(10) USAGE-DISPLAY-2.

61 DISPLAY:2.

02 PART-NUM PIC 9(8) USAGE DISPLAY-1.

61 ITEM-INFORMATION.

61 DIS:1.

02 PART-PRICE PIC 9(6) COMP-1.

61 ITEM-INFORMATION.

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61 PAD: '*'.

This example is a simple illustration of the placement of item definition level 61 entries. All occurrences of the 61 DISPLAY or 61 PAD-CHARACTER entries must follow the 61 ITEM-INFORMATION entry.

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3.5 Primary Key Definition

The basis for the Restructurer algorithm is its requirement that every source and target group have primary keys within it such that each instance of a given group can be uniquely identified from all other instances. Primary keys for a group can come from either or both of two sources.

 A group can wholly contain all item within it such that instances can be uniquely identified. CALC records are good examples since the fields used for randomization must have unique values for each record instance.

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2. Only some of the items necessary to uniquely identify a group instance actually reside within the group. The remaining key items are contained in the owner group(s).

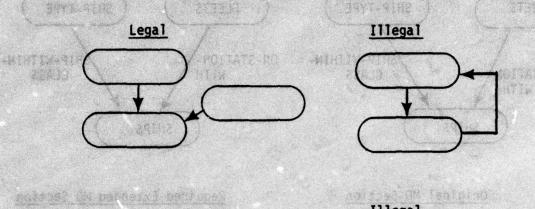
The following statements provide this information.

- 02 TRANSLATION-INFORMATION SIZE O.
- 61 PRIMARY-KEYS.
- 61 GROUP: group-name-1,
- 61 ITEMS: item-name-1 [,item-name-2] ...
- 61 EXTERNAL_KEYS-FROM: relation-name-1 [,relation-name-2] ...
- 61 GROUP: group-name-2,
- 61 ITEMS: item-name-1 [,item-name-2]
- 61 EXTERNAL-KEYS-FROM: relation-name-1 [,relation-name-2] ...

Correst Rules: It to inspecially and the notational states and a strate and adjusts and

- group-name-1, group-name-2.... must be groups defined within the current 01 record for which the 02 TRANSLATION-INFORMATION appears. Specifically, group-name-1 must be the 01 record name and groupname-2...group-name-n must be contained-in-repeating groups owned by group-name-1.
- 2. The item-name-1... beneath the 61 GROUP entry must be contained only within that group.
- The relation-name-1, relation-name-2... immediately following 61 GROUP: group-name-n clause must be one of the following:
 - a) the name of the chain for which group-name-n is a DETAIL (see rule 1 in Section 3.2.3 when the chain name is modified).
 - b) the name of the concatenated relation generated where groupname-n is a member (see rule 3, Section 3.2.3).
 - the name of a match-key relation for which group-name-n is a dependent.
 - d) the name of a phantom pointer relation for which group-name-n is a dependent.

4. Loops or cycles of primary key derivation are not permitted. That is, if the arrows represent the paths where primary keys are defined via the EXTERNAL-KEYS-FROM clause, then the following illustrates legal and illegal cases of this rule.



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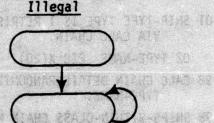
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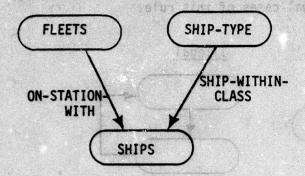
[Anidamy Key dorination]

- 5. Every group defined by the user must have primary keys.
- 6. Groups at the "top" of a database, e.g., those groups that are not details of any non-CALC chain must have at least one key item and all of its key items must be present within that group.

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[Primary Key definition]

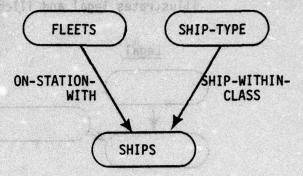
Original Schema.



Original MD Section

- 01 SHIP-TYPE TYPE IS 1 RETRIEVAL VIA CALC CHAIN.
 - 02 TYPE-NAME PIC X(20).
- 98 CALC CHAIN DETAIL RANDCHIZE ON TYPE-NAME.
- 98 SHIPS-WITHIN-CLASS CHAIN MASTER CHAIN-ORDER AFTER.
- 01 FLEETS TYPE IS 2 RETRIEVAL VIA CALC CHAIN.
 - 02 FLEET-DESG PIC X(40).
- 98 CALC CHAIN DETAIL RANDOMIZE ON FLEET DESG. Aver frame grade 1140-non-yet
- CHAIN-ORDER IS AFTER.
- 01 SHIPS TYPE IS 10 RETRIEVAL VIA SHIPS-WITHIN-CLASS CHAIN.
 - 02 SHIP-NAME PIC X(15).
 - 02 SHIF-SKIPPER PIC X(20).
- 98 ON-STATION-WITH CHAIN DETAIL SELECT CURRENT MASTER.
- 98 SHIPS-WITHIN-CLASS CHAIN DETAIL SELECT CURRENT MASTER.

Desired Translator-viewed Schema



Required Extended MD Section

- 01 SHIP-TYPE TYPE IS 1 RETRIEVAL VIA CALC CHAIN.
 - 02 TYPE-NAME PIC X(20).
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 PRIMARY-KEYS.
 - 61 GROUP: SHIP-TYPE,
 - 61 ITEMS: TYPE-NAME.
- 98 CALC-CHAIN DETAIL RANDOMIZE ON TYPE-NAME.
- 98 SHIPS-WITHIN-CLASS CHAIN MASTER CHAIN-ORDER IS AFTER.
- 98 ON-STATION-WITH CHAIN MASTER OT FLEETS TYPE IS 2 RETRIEVAL VIA CALC CHAIN.
 - 02 FLEET-DESG PIC X(40).
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 P-K.
 - 61 G: FLEETS,
 - 61 I: FLEET-DESG.
 - 98 CALC CHAIN DETAIL RANDOMIZE ON FLEET DESG.
 - 98 ON-STATION-WITH CHAIN MASTER CHAIN-ORDER IS AFTER.

Original MD Section

Desired Intestatory risked Schedu

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Required extended MD Section

- OI SHIPS TYPE IS 10 RETRIEVAL VIA SHIPS-WITHIN-CLASS CHAIN.
 - 02 SHIP-NAME PIC X(15).
 - 02 SHIP-SKIPPER PIC X(20).
 - 02 T-I SIZE O.
 - 61 PRIMARY-KEYS.
 - 61 G: SHIPS,
 - 67 I: SHIP-NAME.
 - 61 E-K-F:
 - 61 SHIPS-WITHIN-CLASS.
- 98 ON-STATION-WITH CHAIN DETAIL SELECT CURRENT MASTER.
- 98 SHIPS-WITHIN-CLASS CHAIN DETAIL SELECT CURRENT MASTER.

Additional Information

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The SHIP-NAME item with SHIPS is not sufficient to identify uniquely SHIPS instances. To do this requires knowing what type a given SHIP is.

This example shows the most straight-forward application of primary key definition. Since FLEETS and SHIP-TYPE are CALC records they are by definition uniquely identified by their randomize fields. SHIPS is a secondary record and requires the inclusion of the keys from one of its masters to uniquely identify a given SHIPS instance. In general, there is nothing within the MD section that states which items are primary keys; the user must know his/her database to define primary keys. Incorrect selection of primary keys will generally lead to incorrect target databases.

Note that the IDS Analyzer will generate two set significant items for the SHIPS record, one of which will be a primary key. These are (according to rule 4 in Section 3.2.3):

This example interest of vertices of the property of the property of the property of the content of the content

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FLEET-DESG<ON-STATION-WITH>

TYPE-NAME<SHIPS-WITHIN-CLASS> (primary key)

[Primary key definition]

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ALL MATERIAL OF Original Schema

STEREO-SYSTEMS

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Original MD section

OI STEREO-SYSTEMS TYPE IS 1 ...

02 OWNER-NAME PIC X(20).

02 MADE-UP-OF SIZE 90.

03 COMPONENTS OCCURS 5 TIMES SIZE 90.

visuoine v t at 29 Mg with 04 COMP-NAME PIC X(10). 61 OCCURS 5 TIMES 04 COMP-PRICE PIC 9(6) COMP-1 02 BOUGHT-FROM PIC X(20).

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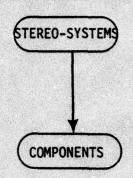
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Desired Translator-viewed Schema

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Required Extended MD Section

01 STEREO-SYSTEMS

02 OWNER-NAME PIC X(20).

02 MADE-UP-OF SIZE 90.

03 COMPONENTS OCCURS 5 TIMES SIZE 90.

04 COMP-NAME PIC X(10).

04 COMP-PRICE PIC 9(6) COMP-1.

61 EOG.

02 BOUGHT-FROM PIC X(20).

02 TRANSLATION-INFORMATION SIZE O.

Transfer one 2024 Annie zonesa such mars 61 PRIMARY-KEYS.

61 G: STEREO-SYSTEMS.

61 I: OWNER-NAME.

61 G: COMPONENTS,

61 I: COMP-NAME.

61 E-K-F:

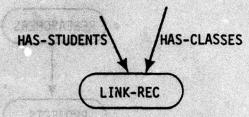
61 STEREO-SYSTE/OWNS/COMPON

61 ENTS.

This example illustrates the basic principles for defining primary keys for contained-in-repeating groups. Note that the primary key of COMPONENTS is the combination of OWNER-NAME and COMP-NAME. The E-K-F clause uses the IDS Analyzer generated name for the concatenated realtion. Finally, observe that the size of COMPONENTS group is 90 which is not 5 x (10+6). Two slack characters are required at the end of each instance of components according to rule 2 of Section 3.2.1.

[Primary key definition]

Original Schema



Original MD Section

01 LINK-REC TYPE IS 3 RETRIEVAL VIA HAS-STUDENTS CHAIN.

> 98 HAS-STUDENTS CHAIN DETAIL SELECT CURRENT MASTER.

98 HAS-CLASSES CHAIN DETAIL SELECT CURRENT MASTER.

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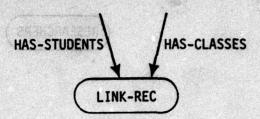
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Desired Translator-viewed Schema

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Required extended MD Section

- 01 LINK-REC TYPE IS 3 RETRIEVAL VIA HAS-STUDENTS CHAIN
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 G: LINK-REC,
 - 61 E-K-F:
- 61 HAS-STUDENTS:
 - 61 HAS-CLASSES.
 - 98 HAS-STUDENTS CHAIN DETAIL SELECT CURRENT MASTER.
 - 98 HAS-CLASSES CHAIN DETAIL SELECT CURRENT MASTER.

its stant C.S.E shitted

Many IDS databases contain <u>relator</u> or <u>link</u> records between two record types. A link record is required if a relationship exists both ways between the two record types. This example illustrates the declaration of primary keys for a link record. Note that every group (record) must have primary keys even if it does not contain any items. In this case, the primary keys of LINK-REC are the primary keys of LINK-REC's two master record types.

In this example, the case has consent along the recording the "the "this will all

a group for restructuring surto assist the end of the enduring the total princery rays seclared for its. Associate character there are KSISARINGE could Wars on a often avoient then to igeniffy a gentley a gentley of and item over assign a on the from and have from expendences (o.e. actionally and the contract that at avier and at entertained property 2777.349 decree to test ent test test

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[Primary key definition]

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Original Schema

RESEARCHERS

Original MD Section

- 01 RESEARCHERS TYPE IS 1 RETRIEVAL VIA CALC CHAIN.
 - 02 RESEARCHER-NAME PIC X(30).
 - 02 PROJECTS-WORKED-ON SIZE 50.
 - 03 PROJECTS PIC X(10) OCCURS 5 TIMES.

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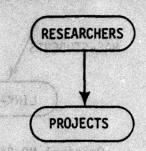
98 CALC CHAIN DETAIL RANDOMIZE ON RESEARCHER-NAME.

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SELECT CONSENT MASITER.

Desired Translator-viewed Schema

Tableta (186 voi visate)



Required Extended MD Section

- 01 RESEARCHERS TYPE IS 1 RETRIEVAL VIA CALC CHAIN.
- 02 RESEARCHER-NAME PIC(30).
 - 02 PROJECTS-WORKED-ON SIZE 50.
 - 03 PROJECTS PIC X(10) OCCURS 5 TIMES.
 - 61 OCCURS 5 TIMES.
 - 61 EOG.
 - 02 TRANSLATION-INFORMATION SIZE O.

the very definitely seem

- 61 PRIMARY-KEYS.
- 61 G: RESEARCHERS.
- the sea out the state of the state of the state of the state of I: RESEARCHER-NAME.
 - 61 G: PROJECTS,
 - 61 I: PROJECTS/IT.
 - 61 E-K-F:
 - 61 RESEARCHERS/OWNS/PROJECT
 - 61 S.
 - 98 CALC CHAIN DETAIL RANDOMIZE ON RESEARCHER-NAME.

In this example, the user has chosen to make the repeating item "PROJECTS" a group for restructuring purposes. Because it is a group it must have primary keys declared for it. Assuming that more than one RESEARCHER could work on a given project, then to identify a PROJECTS record the PROJECTS/IT item and keys from RESEARCHERS (e.g., RESEARCHER-NAME) is required. Note that the item for the group PROJECTS is named according to the rules in Section 3.2.3 (rule #2).

3.6 Relation Definition

In normal IDS databases, relations between record types are implemented via the 98 CHAIN MASTER - CHAIN DETAIL combination. The IDS Analyzer will automatically store into the SDDL tables a relation for every CHAIN MASTER - CHAIN DETAIL pair with the relation name the same as the chain name (subject to rule 1 Section 3.2.3). However, because IDS is somewhat restrictive in terms of legal database schemas, certain users have implemented new relations outside the bounds or knowledge of the IDS software. For data translation purposes, two extraordinary constructs used to implement relations can be defined via level 61 entries. These constructs are match-key relations and phantom pointer relations.

3.6.1 Match-key Relations

Match-key relations exhibit the following characteristics:

- There is no physical implementation of the relation via pointers.
 Instead, the relation exists between two record types if the values of items designated as the "match-keys" have identical values.
 - 2. One record type of the relation is denoted to be the parent and the other record type is the dependent of the relation.
 - 3. The parent and dependent record types may be the same record type. That is, for any one instance of that record type, its dependents are all other record instances of that type that possess the same match-key values as the parent.

```
O2 TRANSLATION-INFORMATION SIZE O.
61 MATCH-KEY-RELATIONS.
61 PARENT: group-name-1,
61 KEYS: item-name-1 [,item-name-2] ...;
61 RELATION: relation-name-1,
61 DEPENDENT: group-name-2,
61 KEYS: item-name-3 [,item-name-4] ...
61; PARENT: group-name-3,
61 KEYS: item-name-5 [,item-name-6] ...;
61 RELATION: relation-name-2,
61 DEPENDENT: group-name-4,
```

61 KEYS: item-name-7 [item-name-8] ...

Rules:

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- 1. MATCH-KEY-RELATIONS must have as its immediately preceding 02 entry "02 TRANSLATION-INFORMATION SIZE O". In general, MATCH-KEY-RELATIONS may either precede or follow the level 61 entries for primary keys and phantom pointers.
- group-name-1, group-name-3, etc., must be a groups defined within the current O1 record where the MATCH-KEY-RELATIONS appears. This restricts the parent of a match-key relation to be either the O1 record name or a contained-in-repeating group defined within the current O1 record.
 - group-name-2, group-name-4, etc., may be any group within the entire level 61 extended MD section and is designated as the dependent of the relation.
 - relation-name-1, relation-name-2, etc., can be any name except for chain names or other names already used for concatenated, phantom pointer or match-key relations.
 - 5. item-name-1, item-name-2, etc., must be items within the parent group.
- 6. item-name-3, item-name-4, etc., must be items within the dependent group of the relation.
- The number and type of the items in the parent must be exactly the same as those of the dependent.
 - 8. Multiple match-key relations can be defined within the same MATCH-KEY-RELATIONS section by placing a semicolon after the last key item in the dependent and then repeating the syntax as specified.

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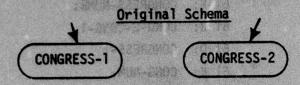
6) DEPENDENT: qradio-name-2,

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9. Match-key relations cannot be de defined for target databases.

[Match-key definition]

Regulated Extension NO Section

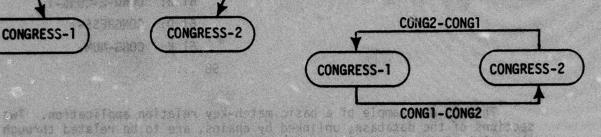


Original MD Section

- 01 CONGRESS-1 TYPE IS 1 ...
 - 02 CONG-NUM PIC X(4).
 - 02 YEAR-START PIC 9(4).
- 98 ...
- 01 CONGRESS-2 TYPE IS 2 ... 02 CONGRESS-NUMB PIC X(4).
- 98 ...

Desired Translator-viewed Schema

Original MB Section



the value of the foundation (Subjects-author) under or ago values. The result Required Extended MD Section

- O1 CONGRESS-1 TYPE IS 1 ...
 - 02 CONG-NUM PIC X(4).
 - 02 YEAR-START PIC 9(4).
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 MATCH-KEY-RELATIONS.
 - 61 PARENT: CONGRESS-1,
 - 61 KEYS: CONG-NUM:
 - 61 RELATION:
 - 61 CONG-1-CONG-2.
 - 61 DEPENDENT:
 - CONGRESS-2,
 - 61 KEYS: CONGRESS-NUMB.
 - 61 PRIMARY-KEYS.
 - 61 G: CONGRESS-1,
 - 61 I: CONG-NUM.
- 98 ...
- 01 CONGRESS-2 TYPE IS 2 ...
 - 02 CONGRESS-NUMB PIC X(4).
 - 02 T-I SIZE O.
 - 61 P-K.
 - 61 G: CONGRESS-2.
 - 61 I: CONGRESS-NUMB.
 - 61 MATCH-KEY-RELATIONS.

Original MD Section

Desired Translato - viewed Schale

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61 PARE (CE CONSCESS-1)

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Required Extended MD Section

61 PA: CONGRESS-2,

61 K: CONGRESS-NUMB;

61 R: CONG-2-CONG-1.

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01 CONTRACT S-22 FALLS 2 ...

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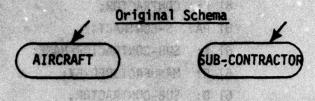
61 D: CONGRESS-1

61 K: CONG-NUM.

98 ...

This is an example of a basic match-key relation application. Two sections of the database, unlinked by chains, are to be related through the value of the (CONG-NUM, CONGRESS-NUMB) tuple of key values. The result of this description to the Restructurer will be no different than if CONGRESS-1 and CONGRESS-2 were related via chains. Note that the level 61 entries for CONGRESS-2 utilize the legal MATCH-KEY-RELATIONS abbreviations.

[Match-key definition]



Original MD Section

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- 01 AIRCRAFT TYPE IS 1 ...
 - 02 AIRCRAFT-NAME PIC X(20).
 - 02 CONTRACTOR PIC X(15).

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02 ALSO-MADE-BY SIZE 200.

03 S-CONTRACT OCCURS 10 TIMES SIZE 200.

04 SUB-CONTRACTOR-NAME 61 OCCURS 10 TIMES.

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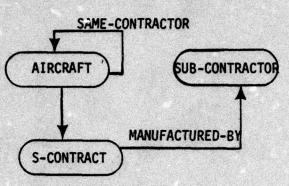
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01 SUB-CONTRACTOR TYPE IS 2 ... 02 T-I SIZE 0. 02 SUB-NAME PIC X(20). 02 SUB-LOCALE PIC X(40). 98 ... At the major of the court of the cour

Desired Translator-viewed Schema

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Required Extended MD Section

- 01 AIRCRAFT TYPE IS 1 ...
 - 02 AIRCRAFT-NAME PIC X(20).
 - 02 CONTRACTOR PIC X(15).
 - 02 ALSO-MADE-BY SIZE 200.
 - 03 S-CONTRACT OCCURS 10 TIMES SIZE 200.
- PIC X(20). 04 SUB-CONTRACTOR-NAME 98 ... PIC X(20).

61 EOG.

- 61 P-K.
- 61 G: AIRCRAFT,
- 61 I: AIRCRAFT-NAME.
- 61 G: S-CONTRACT
- 61 I: SUB-CONTRACTOR-NAME.
- 61 E-K-F:
- 61 AIRCRAFT/OWNS/S-CONTRACT
- 6) March Mar red alors 16
- 61 MATCH-KEY-RELATIONS.
- 61 PA: AIRCRAFT.
- 61 K: CONTRACTOR:
- 61 R: SAME-CONTRACTOR.
- 61 D: AIRCRAFT

Original MD Section

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Required Extended MD Section

61 K: CONTRACTOR:

61 PA: S-CONTRACT;

61 K: SUB-CONTRACTOR-NAME;

61 R: MANUFACTURED-BY;

61 D: SUB-CONTRACTOR,

61 K: SUB-NAME.

98 ...

01 SUB-CONTRACTOR TYPE IS 2 ...

02 SUB-NAME PIC X(20).

02 SUB-LOCALE PIC X(40).

02 TRANSLATION-INFORMATION SIZE O.

LOS 61 P-K. BRANL TOLOGOTA CO

61 G: SUB-CONTRACTOR,

61 I: SUB-NAME.

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This complex example illustrates the method for coding match-key relations under the following conditions:

- 1. Records AIRCRAFT and SUB-CONTRACTOR are not linked together by any chains or other relationships.
 - 2. The user desires that all AIRCRAFT manufactured by the same manufacturer be linked together.
 - 3. The user desires that the repeating information within AIRCRAFT on sub-contractors be removed from AIRCRAFT and placed into its own group. Furthermore, this group is to be related to the SUB-CONTRACTOR record via the sub-contractor's name.

Note in the example that several things must be accomplished via the level 61 entries.

- a) Primary keys must, as always, be defined for all groups.
- b) The contained-in-repeating group S-CONTRACT must be identified.
- c) Match-key relations from both AIRCRAFT and S-CONTRACT are stated underneath the same Ol record (e.g., AIRCRAFT).

3.6.2 Phantom Pointer Relations

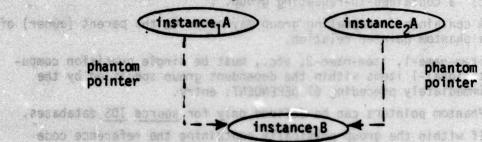
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Of all extraordinary non-IDS constructs implemented by the user phantom pointer relations are the most difficult to describe via level 61 entries. A phantom pointer relation is restricted to the following definition:

- 1. If record or group A possesses a field whose value is that of a reference code to record or group B, then the relationship defined via that pointer is termed a phantom pointer relation.
- 2. A distinction is made between a phantom pointer and a phantom chain. The former is an implementation of a 1:1 relation between groups A and B while the latter is an implementation of a 1:n relation between group A and several instances of group B.

 Phantom Chains are not implemented as a feature of the Data Translator and hence cannot be described via level 61 entries.
 - 3. For all purposes, if a pointer within group A points to an instance of group B, the relation between the two groups has group B as owner (or parent) and group A as member (or dependent). This is the exact reverse of how one would normally regard the relation.

Suppose the following instance schema exists. Group A has a phantom pointer to group B.



If a relation were declared to have A as owner and B as member, then the representation of this relation within the source RIF database would violate the fundamental law of network databases.

- "No member instance may be owned along the same relation type by more than one instance of a given owner group type. Because of this attribute of network databases, the relation must be viewed as though group B were the owner and group A the member."
- 4. Phantom pointers can be described only for IDS Source databases.
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 PHANTOM-POINTERS.
 - 61 RELATION: relation-name-1.
 - 61 DEPENDENT: group-name-1.
 - 61 POINTER: item-name-1

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61 ; RELATION: relation-name-2,

61 <u>DEPENDENT</u>: group-name-2,

POINTER: item-name-2

Rules: The training will ment is quoty to process or shows a consider

- The PHANTOM-POINTERS level 61 entries must appear within the 02 TRANSLATION-INFORMATION for the group (record) that is considered to be the owner (parent) of the relation. See the nicide or both #3 definition of a phantom pointer relation above.
 - 2. relation-name-1, relation-name-2, etc., can be any previously 53 unused chain name, concatenated relation name or match-key relation name.
 - group-name-1, group-name-2, etc., must be the name of the group in which the phantom pointer item physically resides. The dependent of a phantom pointer relation may be following:
 - a) the same group type as the parent.
 - b) a different 01 record than the parent.

to center the case has be owned along the came relation type by to payabak weeks object market agrice a to constitut the half error this attribute of notwerk databased, the relation most be viewed as thosen group to move the sense and group A the member of

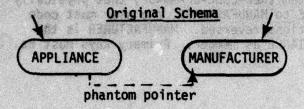
it record or group A possesses a filed among velocity of a

- c) a contained-in-repeating group.
- A contained-in-repeating group may never be the parent (owner) of a phantom pointer relation.
- item-name-1, item-name-2, etc., must be single precision computational-1 items within the dependent group specified by the immediately preceding 61 DEPENDENT: entry.
- Phantom pointers can be defined only for source IDS databases.
- 7. If within the group physically containing the reference code item, that item is zero, then no relation instance between the defined parent group and the member group will be created. Restated, all values of item-name-1, item-name-2, etc. must be either zero or a legal reference code of the parent group type.

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[Phantom-pointer definition]



Desired Translator-viewed Schema MAKES-APPLIANCES APPLIANCE MANUFACTURER

Original MD Section

- O1 APPLIANCE TYPE IS 1 ...
 - 02 APPLIANCE-NAME PIC X(30).
 - 02 REF-CODE-OF-MANUF PIC 9(8) COMP-1.
- 98 ...
- 01 MANUFACTURER TYPE IS 2 ...
 - 02 MANUF-NAME PIC X(30).
 - 02 MANUF-CITY PIC X(15).
- 98 ...

Required Extended MD Section

- 01 APPLIANCE TYPE IS 1 ...
 - 02 APPLIANCE-NAME PIC X(30)
 - 02 REF-CODE-OF-MANUF PIC 9(8) COMP-1.
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 P-K.

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- 61 G: APPLIANCE,
- 61 I: APPLIANCE-NAME.
- 98 ...
- 01 MANUFACTURER TYPE IS 2 ...
 - 02 MANUF-NAME PIC X(30).
 - 02 MANUF-CITY PIC X(15).
 - 02 TRANSLATION-INFORMATION SIZE O.
 - 61 P-K.
 - 61 G: MANUFACTURER,
 - 61 I: MANUF-NAME.
 - 61 PHANTOM-POINTERS.
 - 61 RELATION:
 - 61 MAKES-APPLIANCES.
 - 61 DEPENDENT:
 - 61 APPLIANCE.
 - 61 POINTER:
 - 61 REF-CODE-OF-MANUF.

98 ...

In this basic example of phantom pointer relations, note carefully that despite APPLIANCE having the item (REF-CODE-OF-MANUF) that physically implements a relation from APPLIANCE to MANUFACTURER, the user must code the relation with owner/member positions reversed. MANUFACTURER is the owner of MAKES-APPLIANCES with APPLIANCE as member. Primary keys must be defined as usual for all groups.

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[Phantom pointer definition]

Original Scho ARITH-FUNCTIONS **CALCULATORS** phantom pointers

Original MD Section

01 CALCULATORS TYPE IS 1 ...

TYOMER-HITESAN-70-3000-331 (A

02 MODEL-NAME PIC X(16). 02 MODEL-NAME PIC X(16).

02 MANUF-NAME PIC X(20). 02 MANUF-NAME PIC X(20).

OZ HAS-FUNCTIONS SIZE 300. OZ HAS-FUNCTIONS SIZE 300.

SIZE 300.

04 REF-CODE-OF-ARITH-FUNCTIONS 61 OCCURS 50 TIMES. PIC 9(8) COMP-1. 04 REF-CODE-OF-ARITH-FUNCTIONS

01 ARITH-FUNCTIONS TYPE IS 2 ... 02 FUNCTION-NAME PIC X(10).

98 ...

Desired Translator-viewed Schema **CALCULATORS** ARITH-FUNCTIONS CALCULATORS-WITH-FUNCTION-KEYS FUNCTION

Required Extended MD Section

01 CALCULATORS TYPE IS 1 ...

03 FUNCTION-KEYS OCCUR 50 TIMES 03 FUNCTION-KEYS OCCUR 50 TIMES edo Toles un Act SIZE 300.

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61 EOG.

02 TRANSLATION-INFORMATION SIZE O.

61 P-K

61 G: CALCULATORS.

61 I: MODEL-NAME.

61 G: FUNCTION-KEYS.

61 I: REF-CODE-OF-ARITH-FUN

61 CTIONS.

61 E-K-F:

61 CALCULATORS/OWNS/FUNCTIO

61 N-KEY

98 ...

01 ARITH-FUNCTIONS TYPE IS 2 ...

02 FUNCTION-NAME PIC X(10).

· 02 TRANSLATION-INFORMATION SIZE O.

61 P-K.

61 G: ARITH-FUNCTIONS.

dent 3 capare-do	de Consul Donness		61 1: FUNCTION-NAME. 61 PHANTOM-POINTERS. 61 R:
SHOTTS STANTISH	(ENCOURATIONS)	了。例如17分钟四二	61 CALCULATORS-WITH-FUNCTIO
	1	And the Cartin of Burns of the Control State	61 D: FUNCTION-KEYS,
T -HTTM-250TAJUDJAD	(EVEN-KOTTOKHE)		61 PO:
AUT 13KUA	The control of the Partie of the Control of the Con		61 REF-CODE-OF-ARITH-FUNCTI
notions on the	resul benjapek	98	61 ONS.
1 22 200	T CONTRACTOR IN		The says weeks anything

Frequently, the user implements a set of phantom pointers within a repeating group inside an Ol record. To preserve this relationship as the example shows, requires first that the contained-in-repeating group be defined within CALCULATORS, and second, that the phantom pointer relation be denoted within the owner(e.g. ARITH-FUNCTIONS) of the relation. This is consistent with the rules of phantom pointer definition by having

- a) The "pointed-to" group be the owner of the relation.
- b) The "having reference code" group be the member of the relation. Note that as usual, all primary keys must be defined for every group.

OF AUSTRA-PUNCTIONS TYPE 15 2 ... DE TRANSLATION-INFORMATION SIZE O DZ FURICTION-NAME PIC X(10). 53 P-X 61 C CALCULATORS, ... 89

> 57 ft + 400EL-6AME. AT ST FONCTION-KEYS

and ta

W03-W718A-40-3003-TER :1 (8 LENGTH FR

· 2. W. 2. 78 BI CALCIANTORS/GMMS/FBMCTTO

Y37-8 TO

OF ARITH-FUNCTIONS TYPE IS Z ...

OR FEMILION-MANE PIC K(10). OZ TRAKSLATION-I WEGHERATION SIZE OL

CONDITIONUS - RTIPA - CO CO.

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3. All other 105 MD rules have followed. They include the

3.7 ISP and Sequential Databases

It is a capability of the Data Translator to restructure source ISP and segential databases as well as IDS databases into new target IDS databases. To do this, the following two conditions must be met:

- 1. The sequential or ISP database must conform to the WWDMS T-2 requirement that every record type have a field with a constant value (of no greater than 12 characters) that identifies record instances to be of a particular type. For example, an INVENTORY record would have a field whose value was always "INVENTORY".
- 2. A description of the source ISP or sequential database must be written as if the database were IDS, e.g., an IDS MD section must be prepared. Furthermore, this MD section must be extended or augmented with level 61 entries according to the rules and examples of Section 3 of the User Manual.

Consider condition number 2. Since the Translator requires SDDL tables describing all user databases, and since the only method by which SDDL tables can be produced is via the IDS Analyzer it follows that a description of an ISP or sequential database must be in a form usable by the IDS Analyzer. All input to the IDS Analyzer must be an extended IDS MD section.

The steps required to produce an IDS MD section are simple if the user keeps one thing in mind - an IDS MD section stripped of its IDS peculiarities (PAGE-RANGE, ASCENDING-KEYS, CHAIN-ORDER, etc.) is a method of writing the data definition of a database schema. An IDS MD section uses the concept of OI entries to indicate records, O2 entries to indicate items and 98 entries to designate relations. Clearly an ISP or sequential database contains records, items and relations. They are different from IDS only in their physical representation. Hence in preparing an IDS MD section for an ISP or sequential database, use the following rules:

- 1. Indicate records with an IDS 01 entry.
- 2. Indicate items with IDS 02-49 entries.
- 3. Indicate relations with a 98 chain master entry for the parent of the relation, and a 98 chain detail for the dependent of the relation.

A few specific restrictions must also be observed to insure correct processing by the IDS Analyzer.

- 1. Draw a schema diagram of the ISP or sequential database. This diagram <u>must be</u> of a hierarchical or tree structure. Locate the top (or root) record for the tree. It <u>must</u> be denoted in the MD section as a CALC CHAIN DETAIL record. Choose any item within the record to be the randomize field.
- 2. All relations are given a chain name. The parent record of the relation must contain for that relation the following entry:

98 chain name CHAIN MASTER CHAIN-ORDER IS AFTER.

The dependent of a relation must have the following entry:

98 chain name CHAIN DETAIL SELECT CURRENT MASTER.

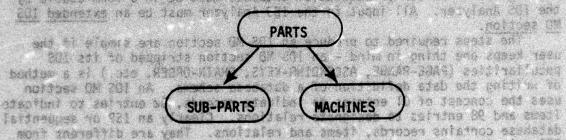
- 3. All other IDS MD rules must be followed. They include the following.
- a) all Ol records must have a TYPE IS and a RETRIEVAL VIA clause.

 What the user actually writes for these clauses must be acceptable to pass the IDS Translator, although the IDS Analyzer will ignore the information.
- b) all 02-49 entries must have either a SIZE clause if a group, or a PICTURE clause if an item.

Once the IDS MD section has been prepared, all of the extensions presented in the preceding part of this section in the User Manual must then be performed, if needed. Additionally, each record must have an identifier field which is prepared according to the rules of Section 3.7.1. When reading any of the rules applying to level 61 entries, the references to IDS databases should be considered as references to sequential or ISP databases.

Controls condition number 2. Since the Translator requires enquire

Suppose an ISP database exists with three records related as shown below. PARTS are made up of SUB-PARTS and machined on different machines.



An IDS MD section for the above ISP database would be similar to the one below.

A few specific restrict was much also be observed to insere

01 PARTS TYPE IS 1 RETRIEVAL VIA CALC CHAIN.

02 PARTS-ID PIC 9(1) VALUE IS 1.

02 PART-NAME PIC X(10).

98 HAS-SUB-PARTS CHAIN MASTER CHAIN-ORDER IS AFTER.

98 MACHINED-ON CHAIN MASTER CHAIN-ORDER IS AFTER

98 CALC CHAIN DETAIL RANDOMIZE ON PART-NAME.

O1 SUB-PARTS TYPE IS 2 RETRIEVAL VIA HAS-SUB-PARTS CHAIN.

O2 SUB-PARTS-ID PIC 9 VALUE IS 2

O2 SUB-PART-NO PIC 9(6).

SE chain dame CHAIN MASTER CHAIN-ORDER IS AFTER.

The dependent of a releation much have the inclinying entry:

98 HAS-SUB-PARTS CHAIN DETAIL SELECT CURRENT MASTER

01 MACHINES TYPE IS 3 RETRIEVAL VIA MACHINED-ON CHAIN.
02 MACHINES-IN PIC 9 VALUE IS 3.
02 MACHINE-NO PIC 9(4).

98 MACHINED-ON CHAIN DETAIL SELECT CURRENT MASTER.

Note that the PARTS-ID, SUB-PARTS-ID, and MACHINES-ID fields identify their respective record types and must be followed by a 61 IDENT entry.

3.7.1 <u>Identifier Items for ISP and Sequential Databases</u>

As noted previously all ISP and sequential database records must contain an item that has a constant value for all instances of a given record type. This section gives the rules for describing this item via level 61 entries.

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RESERVICION CONT.

61 ITEM-INFORMATION.

OF RESCAPENIAR TAPE IS I RETRIEVAL VIA

61 IDENT: 'character string'

O STIZ MITAMOSSME NGLTAJZMANT SU Rules

- 1. 'character string' is a string of up to 12 BCD characters enclosed by single quotes that is the value of the item which identifies the record for which these entries are specified. A single quote cannot be one of the BCD characters.
 - 2. The two level 61 entries must immediately follow (in order) the 02-49 entry for the item that serves as the record identifier.
 - 3. These entries must be specified for every <u>record</u> (not contained-inrepeating groups) within the ISP or sequential database being described.
 - 4. 61 IDENT: 'characters string' cannot appear in level 61 entries for IDS databases.
- It is assumed that 'character-string' is left-justified within the item in the record instance.

A Princey Leys much be defined as usual.

[ISP and sequent[a1] Was alliance are savalating as add temperation

Original Schema

RESEARCHERS

OI RESEARCHERS TYPE IS 1 RETRIEVAL VIA CALC CHAIN.

02 RESEARCH-ID PIC X(10).

OZ RESEARCHER-NAME PIC X(20). 61 ITEM-INFORMATION.

02 RESEARCHER-PHONE PIC 9(7). 61 IDENT: 'RESEARCHER'

98 CALC CHAIN DETAIL RANDOMIZE ON RESEARCHER-PHONE.

Desired Translator-viewed Schema

Your that the EARCHIA MINERAL AND ENGRENSS-10 freign identify their Original MD Section Section Required Extended MD Section

01 RESEARCHERS TYPE IS 1 RETRIEVAL VIA CALC-CHAIN.

02 RESEARCH-ID PIC X(10).

02 RESEARCHER-NAME PIC X(20)

02 RESEARCHER-PHONE PIC 9(7).

02 TRANSLATION-INFORMATION SIZE O.

61 P-K.

OF MACHINES-IN PIC 9 VALUE 25 3...

mendions and become USB SI or on to telesta e of 61 G: RESEARCHERS, I

STORE STORES A CONTINUE OF STORES SOUTH A 61 1: RESEARCHER-NAME.

98 CALC CHAIN DETAIL RANDOMIZE ON RESEARCHER-PHONE.

This example is of a single record type ISP or sequential database. Every RESEARCHERS record instance possesses an item whose value is always "RESEARCHER". Note:

s for selar.

- 1. Because RESEARCHERS is at the top of the schema, it must be a CALC CHAIN DETAIL.
- 2. The level 61 entries for ITEM-INFORMATION and IDENT are written immediately below the RESEARCH-ID field which always has the value
 - 3. Primary keys must be defined as usual.

3.8 Multiple Source Databases

Another feature of the Data Translator is the ability to combine multiple source databases into multiple target databases. This section presents the technique for describing multiple databases.

The procedure for describing multiple databases is simple. Combine all MD sections for each individual database into one file. Consider this to be one large MD section of one database which is broken into sections. Combining the MD sections is necessary because only one SDDL table file is necessary to describe all source databases (similarly for target databases). Hence, only one IDS Analyzer run is required for the source database(s) descriptions, and one also for the target.
Some additional restrictions must also be observed.

- 1. Only 1-5 databases may be combined.
- 2. All chain, record and 03-49 level item names must be unique across the entire combined database description.

4.0 WRITING TOL

The Translation Definition Language (TDL) is a language in which restructuring specifications may be written in Translator-recognizable form. A complete set of restructuring specifications written in TDL is referred to as a TDL description. TDL descriptions are encoded into TDL tables by the TDL Analyzer. The Restructurer's construction of the

5.4

target RIF is directed by the contents of the TDL tables.

In Section 4 is described the process by which the preliminary restructuring specifications discussed in Section 2.4 can be converted into TDL descriptions. Section 4.1 describes the TDL features needed to write TDL descriptions for any set of preliminary specifications except those involving complex item assignments and comparisons. Section 4.2 describes several advanced TDL features which can save the experienced TDL writer time and effort. It also describes the interface between the Restructurer and user-written qualification and conversion routines which are needed to perform the complex item assignments and comparisons that cannot be done directly by the Restructurer. Section 4.3 presents a complete TDL syntax summary.

4.1 Basic TDL - Tree Transcription

The central task in TDL writing is nothing more than the translation of the trees, item correspondences, and comparisons described in Section 2.4 into TDL constructs. Section 4.1.1 describes a few preliminaries used to communicate with the TDL Analyzer as well as human readers of TDL descriptions. Section 4.1.2 outlines the structure of TDL descriptions, and Sections 4.1.3-4.1.11 present the basic TDL statements.

4.1.1 Preliminaries - Comments, Toggles, Macros

Comments may appear anywhere in a TDL description. They begin with "/*" and end with "*/". For example,

/* TOL TO TRANSLATE FOOTBALL DATABASE */

is a valid TDL comment.

The TDL Analyzer recognizes three toggles which set and reset TDL Analyzer options. They are:

- L List (causes input lines to be echoed) default=ON.
- A Analyze (when off, allows semantic analysis of the TDL description without actually constructing TDL tables.

 It is useful for finding grammatical errors in a TDL description). default=ON.
- D Dump (causes TDL tables to be dumped at the end of analysis. TDL Analyzer dumps are in a user readable form. See Section 6 for details). default=OFF.

Tigure 4-1 Till Block Scructure

"\$" sets a toggle ON, "%" turns it OFF. Toggles are set in comments. example,

/* \$D %L */ For example,

sets Dump ON and List OFF. This imposes the only restriction on the content of comments: if they contain an unintentional "\$L", "%D", etc. surprising results may be obtained.

The TDL provides a limited, but very useful, macro facility. A

macro statement has the form:

MACRO <NAME> LITERALLY <LITERAL>

<NAME> can be any character string that is not a TDL reserved word. <LITERAL> is any character string enclosed in single quotes. Common AND THE COPP. BEECH TATTER SETT examples include:

MACRO SR LITERALLY 'SOURCE RECORD'

MACRO AT LITERALLY 'ASSIGN TO'

4.1.2 TOL Structure's syon paidles at paidles in his last leading out

The TDL is a block-structured language. There are four types of tements: the TARGET RECORD statement which consists of a header and one or more TDLAP statements; the TDLAP statement which consists of a header and one or more SOURCE RECORD statements; the SOURCE RECORD statement which consists of a header and one or more ITEM statements which are indivisible. This structure is shown in Figure 4-1.

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SOURCE RECORD

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Analyte (when off, allows select saalysts of the TDL description without actually related actually resident actual arrors in a TRL is useful for finding grammatical errors in a TRL

Dump (causes TDR tables GROSA TARGET the end of analysis. TOL Analyser dumps one to a user readable

Figure 4-1 TDL Block Structure

Form. See Section 5 for details). default=OFF.

Figure 4-2 is a reproduction of the two augmented Bachman diagrams of Figure 2-13. Figure 4-3 gives a TDL description that will accomplish the transformation of 4-2a into 4-2b described by the trees of Figure 2-14, and Figure 4-4 does the same for the b-to-a restructuring of Figure 2-15. In Figure 4-3 it is assumed that the TDL description has already been tested for grammatical errors, so the List toggle has been turned off, while Dump is on so that the resulting TDL tables can be checked. The TDL description of Figure 4-4 is assumed to be freshly written, so that the A toggle has been turned off. Note the use of macros in Figure 4-4.

4.1.3 TARGET RECORD Statement

The TARGET RECORD statement is of the form:

TARGET RECORD target_record-name [TDLAP Statement]

The notation $[...]^n$ indicates that the contents of the brackets are to occur at least m times and no more than n times. If n is not a number but a lowercase "n", then the contents of the brackets may repeat an arbitrary number of times.

There is exactly one TARGET RECORD statement for each target record In it, all the representations of the target record in the source database are described. The TDLAP statements which make up a TARGET RECORD statement describe the trees used to represent the target record in the source database, one TDLAP statement per tree. TARGET RECORD statements begin on lines 3, 9, and 18 of Figure 4-3, and lines 7 and 12 of Figure 4-4.

4.1.4 TDLAP Statement

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The TDLAP statement is of the form:

TDLAP tdlap-name (integer) [target-item-name = float ·literal J

[SOURCE RECORD Statement]

(Braces - { · · · } - indicate that exactly one of the objects inside the braces is to be chosen). A TDLAP (TDL Access Path) statement describes a tree that represents a target record type in the source RIF. There is one TDLAP statement for each of the trees developed in step 3 of Section 2.4. Each tree is assigned a unique tdlap-name, which may be one to twelve characters in length. Examples of TDLAP statements begin on lines 4,10, and 19 of Figure 4-3, and on lines 8, 13, and 20 of Figure 4-4. The trees of Figure 2-14 are described (in order of appearance) by the TDLAPs PARENT-PATH, DAUGHTERS, and SON-FINDER of Figure 4-3. The trees of Figure 2-15 are described (also in order) by the TDLAPs PARENT-PATH, DAUGHTERS, and SONS of Figure 4-4.

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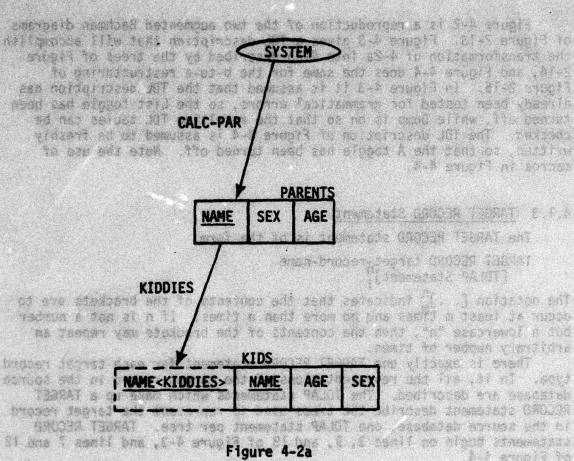
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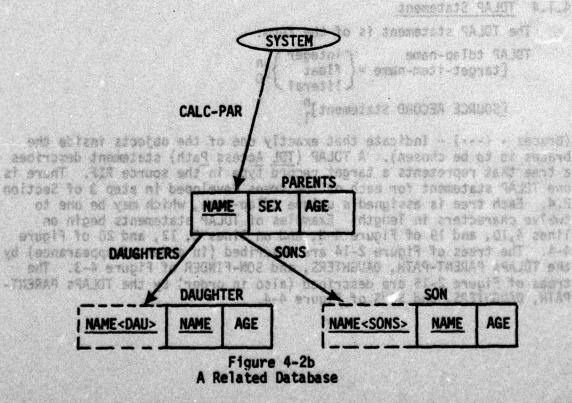
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A Database

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$\prod_{i=1}^{n}$	4.	/* TOL FOR A TO B RESTRUCTURE /* %L \$D */ TARGET RECORD PARENTS TOLAP PARENT-PATH	ib til nere fölk i sk Valet skrive skund	ljie sijule. Anto in likko, di eliseks
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Ü		OTHER DATA BY NAME		
П	8.	/* DONE WITH PARENTS	*/ transit	
U	9.	TARGET RECORD DAUGHTER		
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	12.	NAME ASSIGN TO NAME <da< th=""><th>U></th><th>[Canada au 2 Mai 1]</th></da<>	U>	[Canada au 2 Mai 1]
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		ractor from's length or pad	in changing a cha	

The values of target items which are constant for all instances of the tree are specified next. Such items may be assigned integer, floating-point, or literal values, as in lines 14 and 21 of Figure 4-4. Literals

must be enclosed in single quotes.

Finally, SOURCE RECORD statements are given. These statements specify the nodes of the tree, how they are to be accessed, which comparisons (if any) are to be performed on their items, and how their data is to be used to construct target record instances. Typically, SOURCE RECORD statements make up the bulk of a TDLAP statement.

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4.1.5 SOURCE RECORD Statement

The SOURCE RECORD statement has the basic form:

SOURCE RECORD source-record-name ACCESS VIA source-set-name [ITEM Statement]

This is not the complete SOURCE RECORD statement form. Additional features

are described in Sections 4.2.9 and 4.3.1.

The SOURCE RECORD statement describes a node on a tree. "source-recordname" is the name of the source record type which appears at the node, and "source-set-name" is the name of the source set which connects the node to its parent node on the tree. A parent node must be specified before any of its children can be specified. There is exactly one SOURCE RECORD statement for each node on the tree. Examples can be found at lines 5, 11, 13, 20, and 22 of Figure 4-3, and lines 9, 15, 17, 22, and 24 of Figure 4-4.

The ITEM statement takes three forms: item assignment, comparison specification, and both assignment and comparison together. These

forms are described in the next three sections.

4.1.6 Item Assignments

The item assignment statement specifies the correspondence between a source item on a tree and the target item it represents. The statement has the form:

SOURCE RECORD KIDS ACCESS VIA KIDDIES

'3,AM' 03 TE TOSJEE X32

source-item-name ASSIGN TO target-item-name

Examples are lines 12, 15, 16, 21, 24, and 25 of Figure 4-3, and 16, 18 19, 23, 25, and 26 of Figure 4-4. This statement is adequate for target items which are exactly equal to source items on the tree, and those which have the same value as their source counterparts, but different RIF data types. No additional effort is required to accomplish these "implicit" conversions, since each item's RIF data type (integer, floating-point, or character) and pad character are known to the Translator. A list of these conversions appears in Figure 4-5. Note that an integer-to-character or floating-point-to-character conversion results in a right-justified character string, while in changing a character item's length or pad character, the item is assumed to be left-justified.

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U		/* TOL DESCRIPTION FOR B TO A RI	CTOUCTU	DING */
П	1.		_3 i Nocio	X2110 /
0	2.	/* %A */ MACRO TR LITERALLY 'TARGET RECO	on'	
•	3 4.	MACRO SR LITERALLY 'SOURCE RECO	THE REPORT OF THE PARTY OF THE	
	5.	MACRO AV LITERALLY 'ACCESS VIA'		
	6.	MACRO IS LITERALLY 'ASSIGN TO'		
Π	7.	TR PARENTS		
U	8.	TOLAP PARENT-PATH		
	9.	SR PARENTS AV CALL-PAR		
U	10.			
П	11.	OTHER DATA BY NAME		
U	12.	and the second s		
O	i 13.	TDLAP DAUGHTERS		
	14.	SEX = 'FEMALE'		
	a15.	SR PARENTS AV CALC-PAR		
	2 16.	NAME IS NAME <kiddies></kiddies>		
	17.	SR DAUGHTER AV DAUGHTERS		
Π	18.	NAME IS NAME		
U	19.	AGE IS AGE		
П	20.	TDLAP SONS		
U	21.	SEX = 'MALE'	1 8	I.I
О	22.	SR PARENTS AV CALC-PAR		
	23.	NAME IS NAME <kiddies></kiddies>		
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Figure 4-4 More TDL

Restrictions	none	Target item must be at least twelve characters in length. Result is right-justified in the first twelve characters of the target item and padded on the left with blanks	. OWIN	same as 2	Source item assumed left- justified. Target item may have different length and/ or pad character Item must begin with number, or be padded on left with blanks.
Target Item Type	floating point	character	integer	character	character integer floating point
Source Item Type	1. integer	2. Integer	3. floating-point	4. Floating-point	5. character 6. character 7. character

Figure 4-5
"Implicit" Conversions

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All other functions which convert source items to target items must be performed by user-written conversion routines. These are described in Section 4.2.3.

It should be observed that set-significant items are assigned in exactly the same way as actual data items (lines 12 and 21 of Figure 4-3

and lines 16 and 23 of Figure 4-4).

Finally, under certain circumstances, it is possible to specify the correspondence of a block of items with one statement. If all of a target record's actual data items are represented by items from a single source record, and furthermore, if the source and target record's items correspond one-for-one and in order, then

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ACTUAL DATA IN ORDER

specifies that the source record's data is to be assigned as a block to the target record's data. The source record must have exactly the same number of items as the target record, they must correspond in order, corresponding items must have identical lengths and pad characters, and the actual primary key items of the source record must all correspond to actual primary key items in the target record, and vice versa. In summary, ACTUAL DATA IN ORDER may be used if the source and target records are identical or differ only in their set-significant items. ACTUAL DATA IN ORDER is used at line 6 of Figure 4-3 and line 10 of Figure 4-4. This feature could not have been used anywhere else in Figures 4-3 and 4-4.

Lines 7 of Figure 4-3 and 11 of Figure 4-4 appear because of an unpleasant anomaly in the TDL Analyzer implementation. If ACTUAL DATA IN ORDER is used, it must be the first item statement in the SOURCE RECORD statement, and it must be followed by at least one other item statement. Ir general, set-significant items will be assigned, or qualification eria specified. However, some transformations will require the use em statements which do not serve any purpose besides preventing the E RECORD statement from ending with ACTUAL DATA IN ORDER. OTHER DATA ME is useful in this way, provided the target record has no setificant items, as in the examples at hand. (For a discussion of more c structive uses of OTHER DATA BY NAME, see Section 4.2.2). If the target record has set-significant items as yet unassigned, then a selection criterion that will always be satisfied should be given. For example, line 11 of Figure 4-4 might be replaced by

SEX SELECT IF NE 'KING OF FRANCE'

(Selection criteria are discussed in detail in Section 4.1.7). This difficulty will be corrected in subsequent releases of the Translator. esent to once esentabilities and notification to several material action of the earliest asset to page

4.1.7 Selection Criteria

Item comparisons are specified by item statements of the form:
source-item-name SELECT IF op (float)

op is one of the comparison operators EQ (equal to), NE (not equal to), GT (greater than), GE (greater than or equal to), LE (less than or equal to), or LT (less than). As before, literals must be enclosed in single quotes. Examples of this type of statement are lines 14 and 23 of Figure 4-3.

more comilex exclusion transformations; figure 4-8 propastions slightly

The Restructurer builds a target record occurrence from an occurrence of a tree only if all of the selection criteria for all the nodes on the tree are satisfied. Thus, in our example, DAUGHTER records will be built only from IDS records whose SEX item is equal to FEMALE, and SON records will be built only from IDS records whose SEX item contains the character string MALE followed by two blanks. No target records will be built from KIDS records with SEX items equal to 'GIRL', 'BOY', 'MALE**', 'F', 'etc. If such records exist in the source database, the information they represent will be lost in the target database. Thus, it is essential to verify that every desired target record occurrence exists in an occurrence of a tree in the source RIF that satisfies all of the selection criteria specified for that tree.

4.1.8 Item Assignments and Comparisons Together

Sometimes a restructuring transformation will require that a selection criterion be applied to a source item value, and if the comparison succeeds, the item is assigned to a target item. In that case, both the selection criterion and the item correspondence may be specified in an item statement of the form:

control of the source records date is to be designed as a block to

LETS S'BROSER SERVED AND

source-item-name SELECT IF op float literal ASSIGN TO target-item name

This form of the item statement makes it possible to describe completely a source item's role in a target record in a single statement. For example, if the IDS record type of Figure 4-2a were restricted to children age twelve and under, then lines 19 and 26 of Figure 4-4 would be replaced by:

criterion that till always be satisfied sagaid by gage. For example,

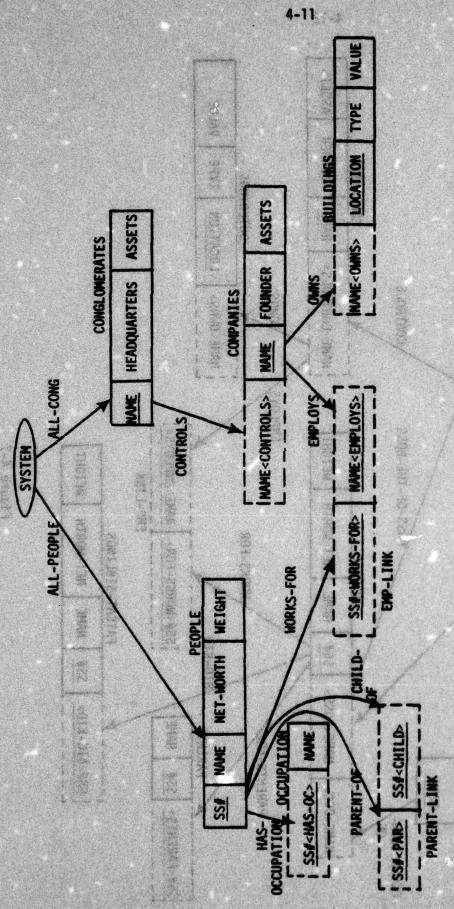
AGE SELECT IF LE 12 ASSIGN TO AGE.

This is equivalent to, but slightly more economical than,

AGE SELECT IF LE 12
AGE ASSIGN TO AGE

4.1.9 Additional SOURCE RECORD Features

The basic form of the SOURCE RECORD statement is adequate for trees in which no source record type appears more than once, as in the previous two TDL examples. However, it is sometimes necessary and/or desirable to use more complicated trees on which one or more source record types appear at least twice. Figures 4-6 through 4-13 illustrate some of these more complex restructuring transformations. Figure 4-6 presents a slightly enlarged version of the "employment" database of Figure 2-9, and Figure 4-7 shows an enlarged version of the semantically valid portion of Figure 2-10. Figure 4-8 contains additional trees, which, along with the trees of Figure 2-16, specify the representation of the Figure 4-7 target database in the source database of Figure 4-6. Figure 4-9 is a TDL description of a restructuring transformation which takes the source schema of Figure 4-6 to the target schema of Figure 4-7. Figure 4-10 shows a small "ancestry" database, and Figure 4-11, a restructured version of it. Figure 4-12 gives trees to describe the restructuring transformation, and Figure 4-13, the corresponding TDL description. These examples are very



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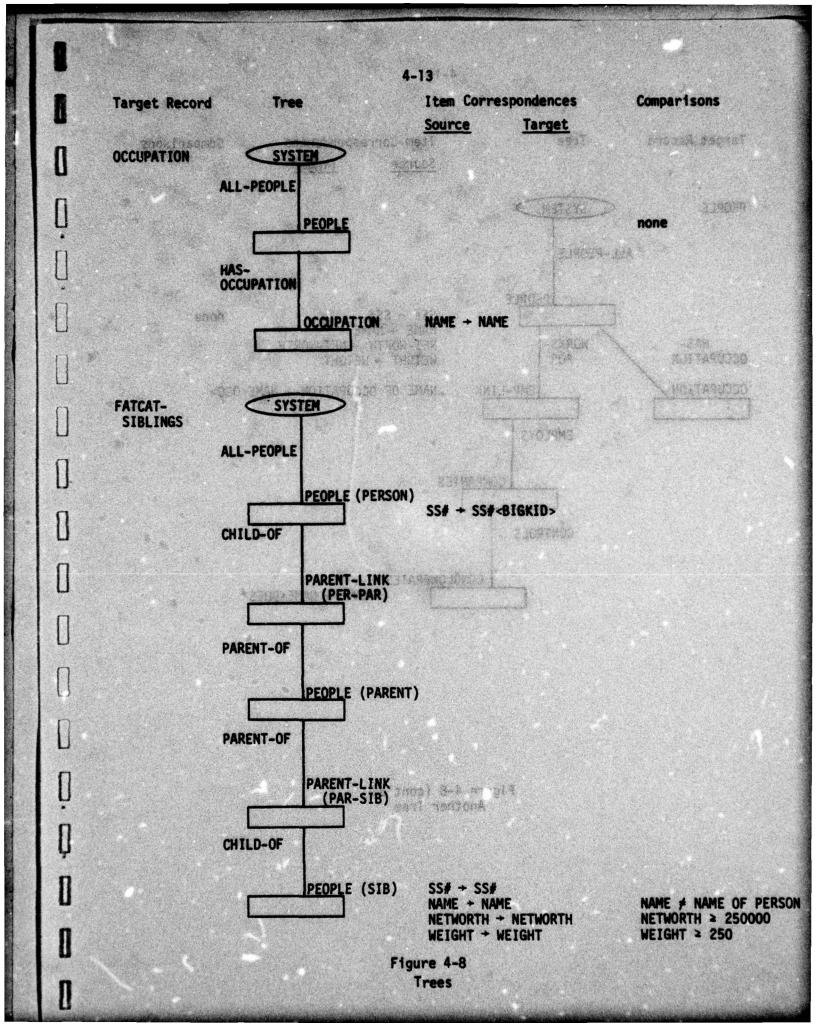
147,4895

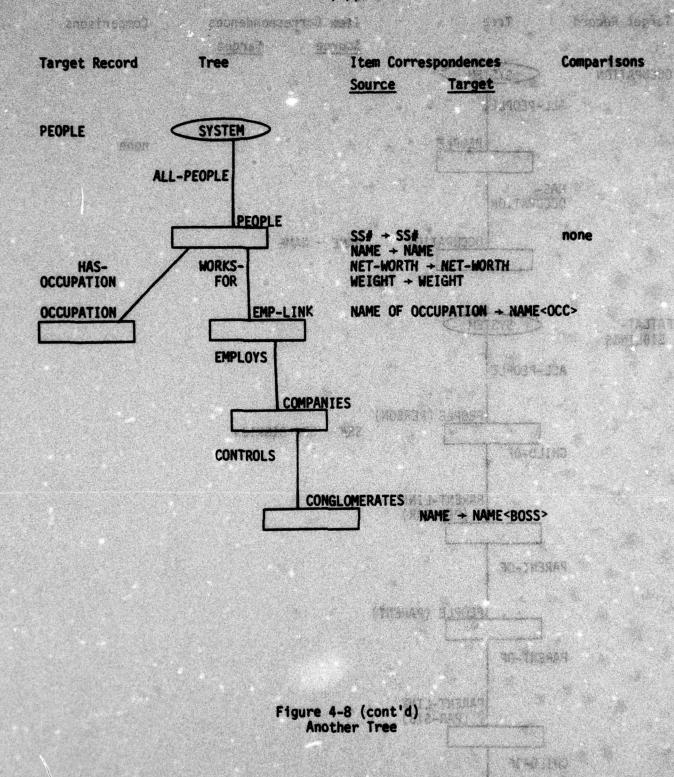
Figure 4-6 Source "Employment" Database

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CHECKENTER .

Figure 4-7 Target "Employment" Database





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		/* EMPLOYMENT DATABASE TOL */ 3.094400 W 731474900	.86
		MACRO SR LITERALLY 'SOURCE RECORD'	28.
		MACRO AV LITERALLY 'ACCESS VIA' 2101942 VA SHELLENS PE	羅
	3.	TALL THE PARTY AND THE PARTY A	.18
ņ	4.	The second compatite with 2 th 127	.55
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	8.	ACTIVAL DATA IN ORDER	1.5
U	9.	OTUCO DATA BY NAME	
	10.	entire the entire term of the entire terms of	- Vi
	11.	TOLAD COMP	
U.	12.	2010	
U	14	SR COMPANIES AV CONTROLS	AT TO
n	15	ACTIAL DATA IN ORDER	
U	16.	FOUNDER SELECT IF NE 'DONALD DUCK'	128
	17.		. 240
	18.	TOU AD BUILD	
	19.	SO CONCLOMEDATES AV ALL-CONG	AT AP
Π	20.	SD COMPANTES AV CONTROLS	100
U	21.	MAME AT NAME CHANS	30
Π	22.	SP RITIDINGS AV OWNS	
U .	23.	ACTUAL DATA IN ORDER	
n	24.	OTHER DATA BY NAME	
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Figure 4-9 TDL Example

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28.	SR COMPANIES AV CONTROLS	•
29.	NAME AT NAME < EMPLOYS - 1880 388 900 100 1 YE 1887 171 1 92 083	M . 9
30.	SR EMP-LINK AV EMPLOYS MAIN 22930AL YSSARESTES VA DRO	AM LE
31.	SR PEOPLE AV WORKS-FOR OF HOLDER VILLERSTELL TA DED	AM .
32.	SS# AT SS# <works-for></works-for>	AT :8
33.	TARGET RECORD PARENTS 1000000 PACKET	
34.	TOLAP PARENT-PATH	A.
35.	SR PEOPLE ID=KID AV ALL-PEOPLE SAMEO AT AVAIL MATTER	, e
36.	SS# AT SS# <parents> SMAW YE ATAM SENTO</parents>	.4
37	SR PARENT-LINK AV CHILD-OF	AT GT
38.	SR PEOPLE ID=PARENT AV PARENT-OF	11
39.	SS# AT SS# ## ### ### ### TA #82 TA #82	
40.	NAME AT NAME CONTROLS SMAN TA SMAN	17.67
41		14.
42.		. 21
43.	SR PEOPLE AV ALL-PEOPLE GRANDS THE TOP THE RECORDER	3.5
44.	SR OCCUPATION AV HAS-OCCUPATION FRANCISCO CARROLLE THE	AT .T.
45.	NAME AT NAME	.,21
46.	TARGET RECORD FATCAT-SIBLINGS CONTOURS CONTOURS CONTOURS CONTOURS	1.64
47.	TOLAP FATCAT ZIONTHOO NA ZELUSTROO NO	.00
48.	SR PEOPLE ID=PERSON AV ALL-PEOPLE 30000-3000 TA 30000	
49.	SS# AT SS# <big kid=""> ZMBO VA ZBMIGLIBS MC</big>	
50.	SS# AT SS# <big kid=""> ZWAD VA ZWATULTUB VA SR PARENT-LINK ID=PER-PAR AV CHILD=OF TAU</big>	23.
51.	SR PEOPLE ID=PARENT AV PARENT-OF	14.45
52	SR PARENT-LINK ID=PAR-SIB AV PARENT-OF FROM ID=PARE	NT . a.s.
53.	SR PEOPLE ID=SIB AV CHILD-OF FROM ID=PAR-SIB	184
54.	SS# AT SS# DECEMBER AT A COTAGONOUS AS	1.0
55.	. NAME SELECT IF NE NAME FROM PEOPLE ID=PERSON AT	NAME
56.	. NET-WORTH SELECT IF GE 250000 AT NET-WORTH	
27	METCHT SELECT TE GE 250 AT METCHT	

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58.	TARGET RECORD PEOPLE		
59.	TOLAP PEEP		
60.	SR PEOPLE AV ALL-PEOPLE		
61.	ACTUAL DATA IN ORDER	91.1mm	
62.	WEIGHT SELECT IF GE -4000	1	
63.	SR OCCUPATION AV HAS-OCCUPATION		Man time (Pin American
64.	NAME AT NAME OCC>	100 g	AND THE COMPANY
65.	SR EMP-LINK AV WORKS-FOR		F Model Comment
66.	SR COMPANIES AV EMPLOYS		
67.	SR CONGLOMERATES AV CONTROLS		greenstand surrounds our debits
68.	NAME AT NAME <boss></boss>	新科林	26.116.374
69.	/* THE END */		
70.	EOF		

Figure 4-9 (cont'd)

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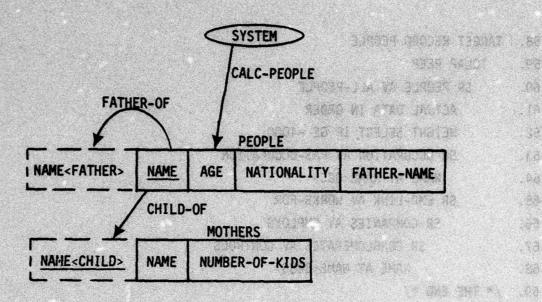


Figure 4-10 "Ancestry" Database

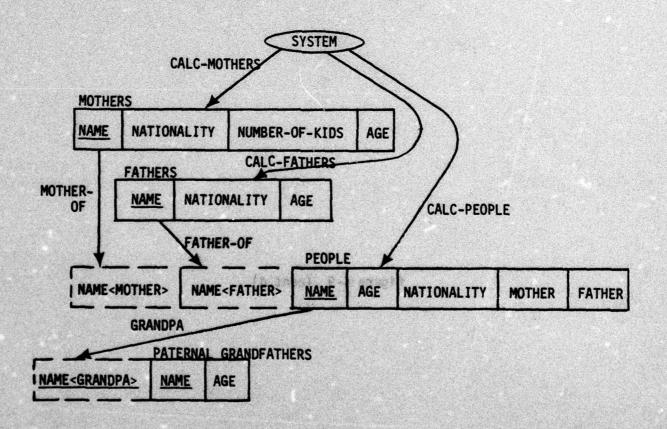
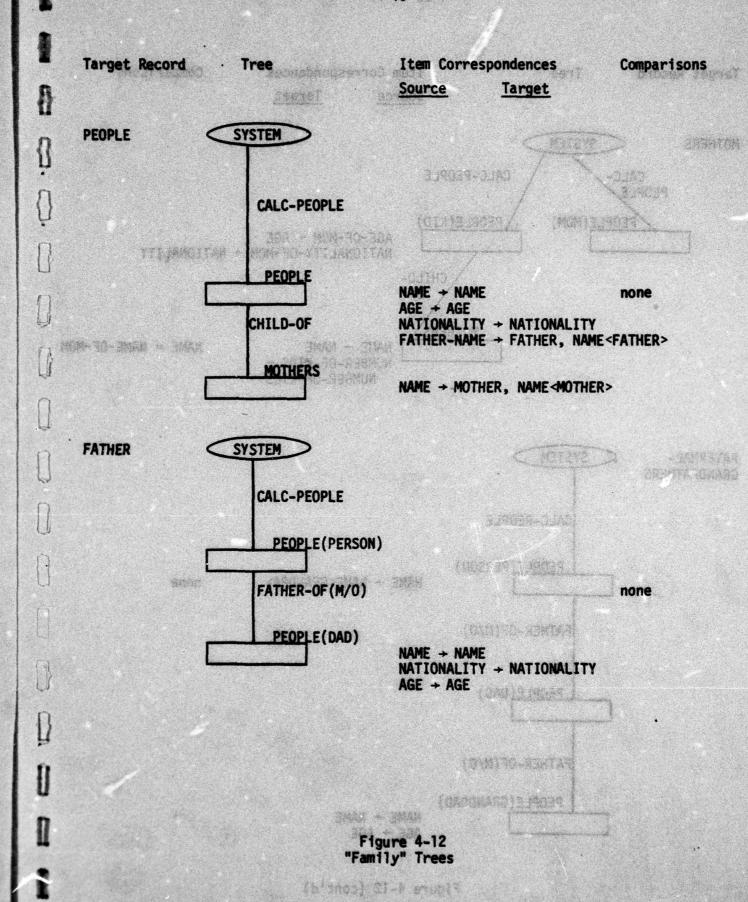
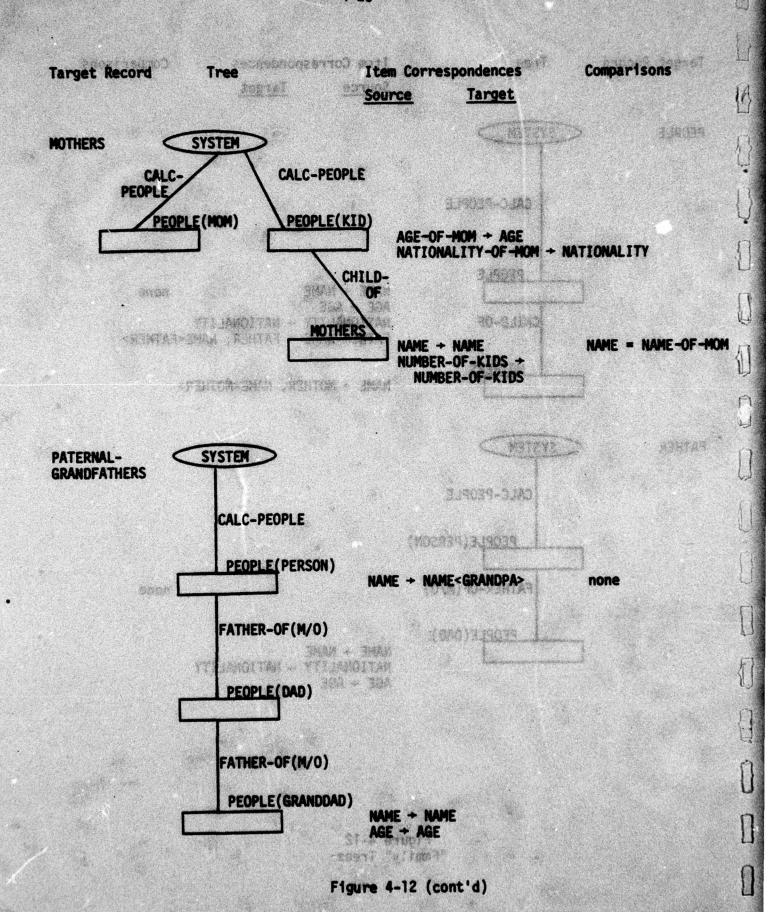


Figure 4-11 Restructured "Ancestry" Database





•		4-21,5-4
0		
п	1.	/* TOL FOR FAMILY TREE TRIMMING */
Ш	2.	MACRO TREC LITERALLY 'TARGET RECORD'
П	3.	MACRO SREC LITERALLY 'SOURCE RECORD'
	4.	MACRO AV LITERALLY 'ACCESS VIA'
•	5.	MACRO IS LITERALLY 'ASSIGN TO'
	6.	MACRO O/M LITERALLY 'OWNER/MEMBER'
U •	7.	MACRO M/O LITERALLY 'MEMBER/OWNER'
П	8.	TREC PEOPLE
U	9.	TOLAP THE-PEOPLE
П	10.	SREC PEOPLE AV CALC-PEOPLE
Ц	11.	
	12.	AGE IS AGE
	13.	NATIONALITY IS NATIONALITY
44	14.	FATHER-NAME IS ASSIGN TO FATHER ASSIGN TO NAME <father< td=""></father<>
	15.	SREC MOTHERS AV CHILD-OF
Ц	16.	NAME IS MOTHER, IS NAME <mother></mother>
П	17.	TREC FATHERS
LJ -	18.	TOLAP DADDY
П	19.	SREC PEOPLE ID=PERSON AV CALC-PEOPLE
Ш	20.	SREC PEOPLE ID=DAD AV FATHER-OF M/O
	21.	NAME IS NAME
	22.	NATIONALITY IS NATIONALITY
Ц	23.	AGE IS AGE
П	24.	TREC MOTHERS
U .	25.	TOLAP MAMA
П	26.	SREC PEOPLE ID=MOM AV CALC-PEOPLE
U.,	27.	AGE IS AGE
1-1	28.	NATIONALITY IS NATIONALITY
	29.	SREC PEOPLE ID=KID AV CALC-PEOPLE
	30.	SREC MOTHERS AV CHILD-OF FROM ID=KID
	31.	NAME SELECT IF EQ NAME FROM PEOPLE ID-MOM IS NAME
4	32.	NUMBER-OF-KIDS IS NUMBER-OF-KIDS

46.

33.	TREC PATERNAL-GRANDFATHERS	
34.	TDLAP GRAMPS	
35.	SREC PEOPLE ID=PERSON AV CALC-PEOPLE	•
36.		
37.	SREC PEOPLE ID=DAD AV FATHER-OF M/O	
38.	SREC PEOPLE ID=GRANDDAD AV FATHER-OF FROM ID=DAD M/O	.8
39.	MAME TO MAME	. 3
40.	AGE IS AGE	
41.	/* DONE WITH ANCESTRY TDL */	
42.	EOF	
	SEED REDILE AV CALCHESINE	
	The state of the s	.1
	BWA 21 Jan	, Ç
	MATERIALITY IS MATERIALITY	ί.
	PATHER-COME IS ASSIGN TO FATHER ASSIGN TO MANY WEIGHT.	\$
	SREE WEIGHTS AV CHILDREN	.2
	ARANG TI MOTULE. IS ADMINISTRATING.	.3
	CREEC PAYMENTS	4
	TOLAR DARBOY	
	SACE PEOPLE TO-PERSON AV CALC-PEOPLE	.0
	SMEC PEOPLE 10-0AB AV PATHUR-OF MAG	.0
	ALTONOMY 18 NAME	
	WALIONALITY IS MATICHALITY	. 1
Gr.	70A CI 30A	. 5
	TREE MITHERS	. \$
	AMAN SALOT	. 2
	SHEC PROPER EDWARD ON CALCUPERING	. č
	AND IS AGE.	10
	Figure 4-13 (cont'd) 41 TILIAMOITAN	.61
	SREC PEOPLE 10-KID AV CALC-PEOPLE	
	SREC MOTHERS AN CHILD-OF FROM IS-KID	.0
	MAME SELECT IF EU NAME FROM PEOPLE 10-NOM IS NAME	. []
	WUMBER-OF-KIDS IS NOWHER-CT-KIDS	

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contrived, of course, and they are not intended as examples of "real life" restructuring transformations. However, they are useful in illustrating

a variety of TDL features.

The source database of Figure 4-6 represents the information contained in the database of Figure 2-9, and in addition, contains a WEIGHT item in the PEOPLE record, another record type, OCCUPATION, and a set, HAS-OCCUPATION. An instance of HAS-OCCUPATION consists of an instance of PEOPLE as owner, and one instance of OCCUPATION as member. The NAME item in the OCCUPATION record gives the person's current occupation. The fact that an instance of HAS-OCCUPATION can have no more than one member instance is reflected in the choice of primary key for OCCUPATION.

The target database of Figure 4-7 is an enlarged version of the target database of Figure 2-10. In addition to the restructuring described by Figure 2-16, this example inverts the relationship between PEOPLE and OCCUPATIONS, and contains a new record type, FATCAT-SIBLINGS, and a new set, BIG-KID. An instance of BIG-KID consists of a PEOPLE record as owner, and as members, one FATCAT-SIBLINGS record for each of the person's siblings who is worth at least \$250,000 and weighs at least 250 pounds.

The basic TDL statements are adequate to describe the source database implementations of the target records CONGLOMERATES, COMPANIES, BUILDINGS, EMP-LINK, OCCUPATION, and PEOPLE. However, the source record type PEOPLE appears twice on the tree used to represent the PARENTS records. Each appearance has been given an identifier which distinguishes it from the others. The rule is: whenever a source record type appears in more than one SOURCE RECORD statement in a TDLAP statement, then each appearance must be given an identifier. Identifiers must be unique across all SOURCE RECORD statements in the TDLAP, and must be one to twelve characters in length. They are specified by:

ID = identifier

immediately following source record type names in SOURCE RECORD statements. Examples are lines 35, 38, 48,50, 51, 52, and 53 of Figure 4-9. This construction also occurs frequently in the TDL description of Figure 4-13.

The primary purpose of these identifiers is to resolve ambiguities in tree descriptions caused by multiple appearances of a source record type. Since RIF sets have one member and one owner type, specification of the source record type of node and the set which connects it to its parent node is enough to specify the source record type of the parent node. For example, line 7 of Figure 4-9 indicates that CONGLOMERATES' parent node record type is SYSTEM, line 14 indicates that COMPANIES' parent node is a CONGLOMERATES record, and line 22 indicates COMPANIES as the parent node type for BUILDINGS. If each source record type appears at most once on a TDLAP, then each SOURCE RECORD statement uniquely determines a parent node, as in the TDLAPS CONGLOM, COMP, BUILD, etc of Figure 4-9. However, when a source record type appears twice or more on a TDLAP, and it is to be the parent of same other node on the tree, then its identifier must be given in the child node's SOURCE RECORD statement in order to determine completely the parent node. This is the case in the TDLAP FATCAT of Figure 4-9, which describes FATCAT-SIBLINGS records. In lines 52 and 53, and id of Figure 4-13, a list of larget than ess

FROM ID = identifier

successed approach classes of to social at burned immediately following the source-set-name in the SOURCE RECORD statement specifies the correct parent node. This TDL feature is also used in Figure 4-13.

Still more information, the direction of access, is required in a SOURCE RECORD statement when a source set's owner and member types are the same. This may occur when the source IDS database contains a match-key set or phantom pointer relation with the same owner and member types. In the example of Figure 4-10, FATHER-OF was a match-key set in the IDS source database, with owner match-key field NAME and member match-key field FATHER-NAME. (Notice that FATHER-NAME and NAME</br>
FATHER-NAME is an actual data item accessible to the user, whereas NAME
FATHER-NAME is an actual data item accessible to the user, whereas NAME
FATHER-NAME is a set-significant item available only to the Restructurer). In line 20 of Figure 4-13, "M/O", which is a macro for "MEMBER/OMNER" is used to indicate that an instance of the parent node (PERSON) is to be a member of the FATHER-OF set owned by the child node (DAD). Thus, there can be at most one instance of the TDLAP "DADDY" containing a given instance of PEOPLE as the PERSON. On the other hand, if M/O were replaced by O/M (owner/member), then an instance of DADDY would contain a PEOPLE record instance as the PERSON and a member of its FATHER-OF set as the DAD. Thus, there would be perhaps many instances of DADDY for a given PERSON, and this would lead to a wealth of invalid FATHERS records.

this would lead to a wealth of invalid FATHERS records.

In line 36 of Figure 4-13, both a FROM specification and an M/O specification are required. The complete form of the SOURCE RECORD statement is

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length. They are year fred the

as follows:

SOURCE RECORD source-record-name [ID=identifier]

ACCESS VIA source-set-name

[FROM ID = identifier]

[item statement]

O

OWNER/MEMBER

MEMBER/OWNER)

4.1.10 Item vs. Item Comparisons

Some restructuring transformations require comparisons of items on a tree with other items on the tree rather than constant values. This is done in the TDLAP FATCAT of FIGURE 4-9, where a check is made (at line 55) to see that a person is not recorded as her or his own sibling, and in the TDLAP MAMA of Figure 4-13, in which line 31 is used to guarantee that target MOTHERS record occurrences are built only from source PEOPLE and MOTHERS records describing the same person.

The selection criterion syntax for item-vs-item comparisons is

source-item-name: SELECT IF op source-item-name: [ID=identifier]]

The FROM specification must be used if source-item-name, does not belong to the same node as source-item-name. The source-record-name given must have previously appeared on the TDLAP. An identifier must be given if it has appeared more than once.

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4.1.11 Multiple Assignments and Comparisons

In some cases, a given source item may represent more than one target item, as in the THE-PEOPLE TDLAP of Figure 4-13. As shown in lines 14 and 16 of Figure 4-13, a list of target item assignments may be used in place of a single target-item-name in an item assignment statement. The only limit on the length of such a list is the number of items in the target record.

Similarly, a source item may be required to satisfy more than one selection criterion. For example, if FATCAT-SIBLINGS were restricted to heavy people worth at least \$250,000 but no more than \$1,000,000, then line 56 of Figure 4-9 would be replaced by:

NET-WORTH SELECT IF GE 250000 SELECT IF LE 1000000

The almost-complete syntax of an item statement is:

source-i tem-name

SELECT IF op float
literal
source-item-name [FROM source-record-name]
[ID=identifier]]

TOP PARTY

ENGERAPHION

[ASSIGN TO target-item-name] n

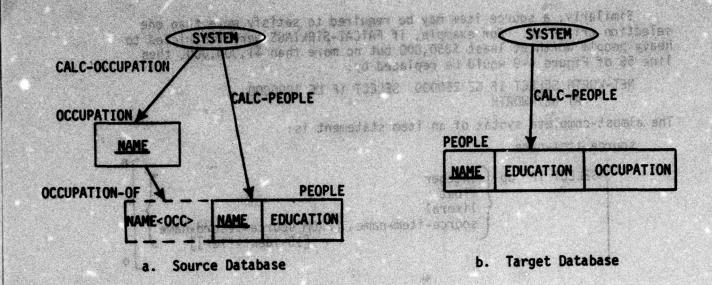
Two more constructs are available in item statements. They specify user-implemented selection criteria and conversions and are described in Section 4.2.3.

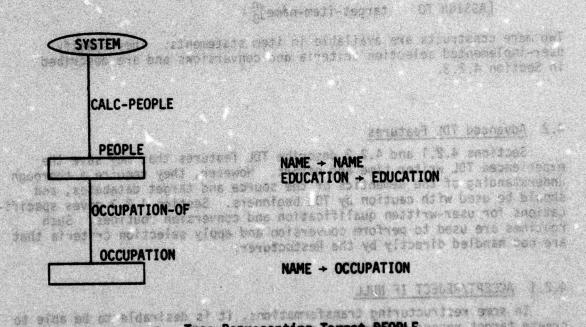
4.2 Advanced TDL Features

Sections 4.2.1 and 4.2.2 describe TDL features that may save the experienced TDL writer time and effort. However, they require a thorough understanding of the semantics of the source and target databases, and should be used with caution by TDL beginners. Section 4.2.3 gives specifications for user-written qualification and conversion routines. Such routines are used to perform conversion and apply selection criteria that are not handled directly by the Restucturer.

4.2.1 ACCEPT/REJECT IF NULL

In some restructuring transformations, it is desirable to be able to create target record occurrences even when a complete instance of a TDLAP is not found. For example, consider Figure 4-14, which shows a very simple source database, target database, tree, and TDL description. Information about people whose occupation is not recorded in the database will be lost, since for them, no complete instance of PEOPLE-BUILD exists in the source data. However, it may be desirable to create target PEOPLE record occurrences for such people, and assign their OCCUPATION items the value 'UNKNOWN'. This can be accomplished by the use of ACCEPT IF NULL. The statement immediately following a SOURCE RECORD statement header may be [ACCEPT] IF NULL. REJECT IF NULL is the default, that is, it is assumed if no such statement is given. REJECT requires that an instance of the source record be found in order to construct a target record instance.





A to sometence Tree Representing Target PEOPLE TO BE T Dies de vos found. For example, consider Figure 4-14, which shows a very

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chapte segment database, target database, tree, and TOL descetation.

evalue 03188-339039 to sometest size once on their some at the last seems at a last Figure 4-14; have not state the contract title of and amount with a such as a simple Example of the and administration broken value 'smouthm'. This can be accomplished by the use of Accept if million

the statement funediately following a SCURGE RECORD statement header may

of August 18 Mail. Ridel It Will is the Assault that is, it is accorded to make the same an instance assault in a such in given to given. He is a required that an instance

assertant brooms sames a sourceases of runns of business broom among all his

	4-27	
1. TARGE 2. TDL	EDUCATION ASSIGN TO NAME SOURCE RECORD OCCUPATION ACCESS VIA OCCUPATION	ATION-OF
nat set (a)mest	d. TDL Description	TECHNOLOGY THE TRANSPORT OF THE TECHNOLOGY THE TECH
•		
	ACTE TO NOTE ACTE ACTE IN NOTE ACTE ACTE ACTE ACT ACT ACT ACT ACT ACT ACT	
74	Figure 4-14 (cont'd) Simple Example	I nendem end it mede I nendem end it mede end beda der it selle it selle
ord to	The standard of Presence and Standard S	Man si eman e'nhalom Mi man ni Jeike i'nh

ACCEPT directs the Restructurer to construct a target record instance even if an instance of the source record is not found (i.e., the source record is null). The target items that would have been assigned values from the source record are assigned "null values" instead. Every item assignment statement of an ACCEPT IF NULL source record must specify a null value. The format is:

source-item-name ASSIGN TO integer [target-item-name NULL VALUE = {float }]_1^n literal

Figure 4-15 contains a rewritten version of the TDL description of Figure

4-14 using this feature.

Two important restrictions are imposed on ACCEPT IF NULL. First, any selection criterion which references an item belonging to a source record will fail if the source record is null, whether or not it is an ACCEPT IF NULL record. This applies to selection criteria specified for the source record, and for inter-record comparisons in which its item(s) are compared to items from other records. Secondly, and obviously, all children of an ACCEPT IF NULL node on a tree must also be ACCEPT IF NULL nodes.

1.	TARGET RECORD PEOPLE
2	TDLAP PEOPLE BUILD
2. 3. 4. 5. 6. 7.	SOURCE RECORD PEOPLE ACCESS VIA CALC-PEOPLE
4.	NAME ASSIGN TO NAME
5.	EDUCATION ASSIGN TO EDUCATION
6.	SOURCE RECORD OCCUPATION ACCESS VIA OCCUPATION-OF
7.	ACCEPT IF NULL
8.	NAME ASSIGN TO OCCUPATION
	NULL VALUE = 'UNKNOWN'
9.	EOF

Figure 4-15 Rewritten Simple Example

As another example, suppose that in the ancestry restructuring of Figures 4-10 through 4-13, we wish to create PEOPLE record occurrences even if the mother is unknown. Then lines 15-16 of Figure 4-13 might be replaced by:

15 SREC MOTHERS AV CHILD-OF
15.5 ACCEPT IF NULL
16 NAME IS MOTHER NULL VALUE = 'NOT-KNOWN'
IS NAME<MOTHER> NULL VALUE = '

MOTHER and NAME<MOTHER> are given different null values, since MOTHER will exist in the IDS target database where it will indicate that the mother's name is unknown whereas NAME<MOTHER> is a set-significant item which must contain a value that will not match any MOTHER record's NAME.

4.2.2 Use of Set-significant Source Items

Set-significant items in a source record may be used in selection criteria and assignments in the same way that actual data items are used, subject to one restriction: a TDLAP which uses set-significant items this way may not use ACCEPT IF NULL.

For example, Figure 4-16 shows a rewritten version of the TDLAP EMP of Figure 4-9 using source set-significant items. When source set-significant items are used, it should be remembered that they are present only if the source record instance is a member of the set to which they are significant. If not, a target record instance is not created. Thus, in the example of Figure 4-16, just as in 4-9, target EMP-LINK records are constructed only from source EMP-LINK records which belong to both the WORKS-FOR and EMPLOYS sets.

7. TARGET RECORD EMP-LINK 2. TDLAP EMP

SR CONGLOMERATES AV ALL-CONG
SR COMPANIES AV CONTROLS

SR EMP-LINK AV EMPLOYS

NAME<EMPLOYS> AT NAME<EMPLOYS> SS#<WORKS-FOR> AT SS#<WORKS-FOR>

Figure 4-16

Source Set-significant items in Action

Three statements permit name-by-name assignment of blocks of items. They are: as men presupposeds respectations to the temporary

SET-SIGNIFICANT DATA BY NAME
OTHER DATA BY NAME
ALL DATA BY NAME

SET-SIGNIFICANT DATA BY NAME is used when all of the target record's set-significant items that have not been explicitly assigned are to receive the values of set-significant items of the same name in the source record. For example, lines 6 and 7 of Figure 4-16 could be replaced by the single line:

OTHER DATA BY NAME has the same effect, and in addition, causes all of the as yet unassigned actual data items in the target record to be assigned the values of items of the same name in the source record. For example, lines 39 and 40 of Figure 4-9 could be replaced by:

39. SO OTHER DATA BY NAME AS SEAS MENT AND ST BUTER WORLD BOT TO MENT OF

Errors will result if either of these statements is used and appropriate

namesakes do not exist in the source record.

Finally, ALL DATA BY NAME causes the entire target record to be assigned from items of the same name in the source record. It must be the only item assignment statement on a TDLAP. For example, lines 22-24 of example 4-9 could be replaced by:

SR BUILDINGS AV OWNS

22. ALL DATA BY NAME The same block of statements could also be rewritten as:

22. SR BUILDINGS AV OWNS

ACTUAL DATA IN ORDER

the set to which they are

24. SET-SIGNIFICANT DATA BY NAME

In fact, the latter form will actually lead to a more efficient Restructurer run, since IN ORDER assignment executes more quickly than BY NAME assignment. As a rule, ACTUAL DATA IN ORDER should be used whenever possible. It often results in significant savings at Restructurer execution time.

4.2.3 User-Supplied Qualification and Conversion Routines

If it is necessary to perform more complicated item qualifications than those using only simple comparison operators (LT, GT, etc.), then a separate subroutine must be written to perform this qualification. Likewise, if an item is to be converted explicitly (i.e., not as described in Section 4.1.6), a subroutine must be written.

User-implemented selection criteria are specified in TDL item state-

ments as follows:

source-item-name [WHEN QUALIFIED BY link-name[(VALUE STATEMENT)]] where VALUE STATEMENT is of the form

> Flaure 4-15 integer float Loopee Service Committee and in Action literal source-item-name [FROM source-record-name [ID=identifier]] he abbola to Empenoises case-Volume times williams

Link-name must be a six-character alphanumeric name and must begin with a letter. This name will be used by the Restructurer to reference the actual user-supplied subroutine. If more than one user-supplied subroutine is desired for one source item, the WHEN QUALIFIED BY clause must be repeated. A target record instance will be created using a specified source item value only if all the user-supplied subroutines indicate that it passes qualification. Also, note that SELECT IF clauses may precede the WHEN QUALIFIED BY clauses. In that case, a target record instance is created only when a) all of the comparisons in the SELECT IF clauses are true and b) all of the user-supplied subroutines specified in the WHEN QUALIFIED BY clauses indicate that the item passes qualification. See Section 4.3 for the complete item statement syntax.

Some user-implemented selection criteria will need only the source item value as input; others may compare it to a constant value or the value of some other item on the TDLAP. In the latter case, the comparison value is specified in the VALUE STATEMENT. The FROM specification must be given if the comparison value is an item that belongs to a TDLAP node different from the one in which the item statement appears, and the identifier

must be given if the node has one.

For example, in the FATCAT-SIBLINGS TDLAP of Figure 4-9, selection of FATCATS might be more complex than as shown, with lines 56 and 57 rewritten as:

NET-WORTH WHEN QUALIFIED BY HOWRCH (NAME) ASSIGN TO NET-WORTH WEIGHT WHEN QUALIFIED BY HOWFAT ASSIGN TO WEIGHT

Man in time all

SE COLLOINES NY CHES

It may be that WEIGHTs can be positive or negative; a positive weight is in pounds, and a negative one in kilograms. The subroutine referred to by HOWFAT would indicate that a positive weight satisfies the fatness criterion if it is at least 250, and a negative weight passes if it is less than or equal to -113.6. The subroutine referred to by HOWRCH could consult a table indicating the percentage of each person's net worth that is in negotiable form. Then a person might qualify as a FATCAT only if his negotiable net worth exceeds \$100,000.

As another example, in the restructuring of Figure 4-13, it may be that NAME items in MOTHERS records contain prefixes---"DR.", "MRS.", or "MS." for example---but NAMEs in PEOPLE records do not. Then line 31 of Figure 4-13 would be replaced by:

31. NAME WHEN QUALIFIED BY NAMEMP(NAME FROM PEOPLE ID=MOM)
ASSIGN TO NAME.

where NAMEMP refers to a routine which strips prefixes from names before comparing them.

Routines which perform complex conversions are specified as follows:

... ASSIGN TO target-item-name [CONVERT WITH link-name]

For example, continuing with our ancestry example, it may be desirable to strip titles from MOTHERS' names in the target database. A routine referred to be NAMCNV could be written to accomplish this, and line 31 would read:

31. NAME WHEN QUALIFIED BY NAMCMP (NAME FROM PEOPLE ID=MOM)
ASSIGN TO NAME CONVERT WITH NAMCNV.

Both qualification and conversion subroutines must contain the following COMMON area through which the item values and lengths are passed.

COMMON/USER/BUF1, BUF2, LEN1, LEN2, IERR

The variables have the following meanings:

BUF1 An integer array of 64 words. This will contain the value of the item to be qualified or converted, with the value left-justified.

LEN1 An integer which contains the length of the item field in BUF1. This length is in bytes.

An integer array of 64 words. In a qualification subroutine, this will contain the value of the item to be compared against if such a value was specified in the TDL. In a conversion operation, BUF2 will contain the converted item on exit from the subroutine. This field will be left-justified.

LEN2 In a conversion operation, an integer which contains the length of the target item in the corresponding target record. This length is also in bytes.

IERR An integer flag set only by a qualification routine as a flag for the Restructurer:

ada data befores b 0 - 1tem accepted AT and adapting an add as set as a sold a state of the set as a sold a sold a state of the set as a sold a state of the set as a sold a sold a state of the set as a sold a sold a state of the set as a sold a sold a sold a sold a sold a sold

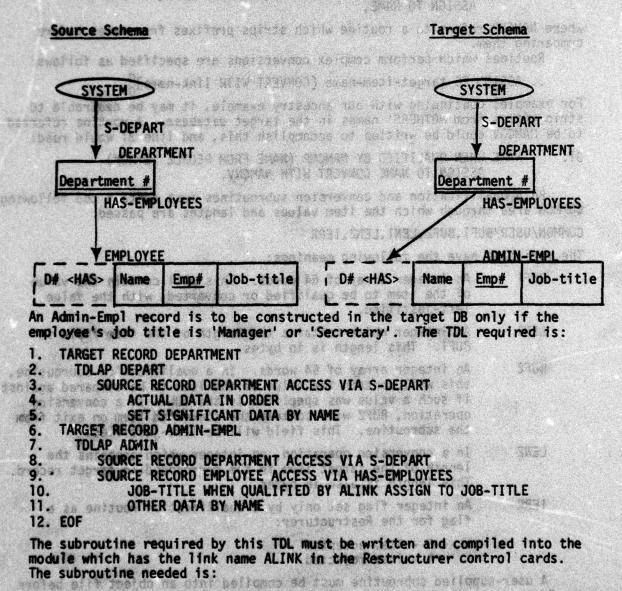
A user-supplied subroutine must be compiled into an object file before the Restructurer is run. This object file must then be specified as a \$LINK in the control card deck setup for the Restructurer. This is detailed in Section 8.7. The name given to this LINK, i.e., link-name, is the name by which the subroutine will be referred to in the TDL.

If an item is to be user-qualified, each time the Restructurer module accesses the item, it will link in the qualification subroutine and pass control to it. The item to be qualified will be in BUF1 and a second item value will be in BUF2 if one was specified in the TDL. The qualification subroutine will return a zero (0) in IERR if the item is to be accepted, and a one (1) if the item is to be rejected.

Likewise, if an item is to be user-converted, each time the Restructurer is about to assign the item to a record in the target RIF, it will link in the conversion subroutine and pass control to it. The item to be converted will be in BUF1, and the subroutine should return the converted

value in BUF2. For example:

The following restructuring is to be performed:

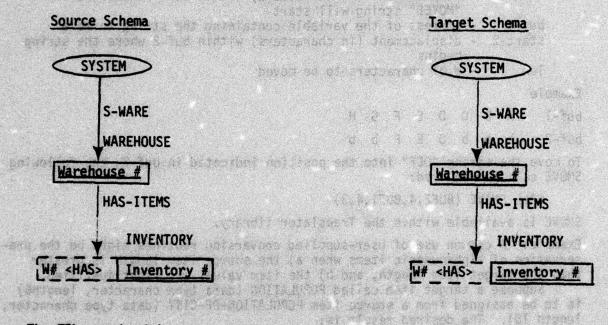


the Restructurer is run. This object the must then be specified as a safeth unthe control card deck keeps for the Restructures. This is detailed in Santion 3.2. The need divento this LIME, i.e. High-mans, is the mone by which the

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SUBROUTINE USERQ1
COMMON/USER/BUF1, BUF2, LEN1, LEN2, IERR
INTEGER BUF1 (64), BUF2 (64), LEN1, LEN2, IERR
INTEGER SECY(2), MNGR(2)
DATA SECY/6HSECRET, 6HARY /
DATA MNGR/6HMANAGE, 6HR /
IERR=1
IF (BUF1 (1).EQ.SECY(1).AND.BUF1 (2).EQ.SECY (2)
& .OR.BUF (1).EQ.MNGR (1).AND.BUF1 (2).EQ.MNGR (2))
& IERR=0
RETURN
END

Example: Restructuring is to be performed where the old inventory numbers are to be suffixed with '000' to allow for more inventory numbers in the new system.



COMPANY USER/OUFF, SUFFE, LEVEL, LEVEL, TOUR CHIPPEER BUILD (CA), ROFE (RA) (LEVELLENC, LERN

The TDL required is:

TARGET RECORD WAREHOUSE 2. TDLAP WAREHOUSE 3. SOURCE RECORD WAREHOUSE ACCESS VIA S-WARE ACTUAL DATA IN ORDER 5. SET SIGNIFICANT DATA BY NAME TARGET RECORD INVENTORY TOLAP INVENTORY 7. set AT pelbautaeyon off 8. SOURCE RECORD WAREHOUSE ACCESS VIA S-WARE SOURCE RECORD INVENTORY ACCESS VIA HAS-ITEMS 9. INVENTORY# ASSIGN TO INVENTORY# CONVERT WITH BLINK 10. 11. SET SIGNIFICANT DATA BY NAME SUPREM THE METERIC 12. EOF

The user conversion subroutine required by the above TDL must be written and compiled into the module which has the name BLINK in the Restructurer control cards. The subroutine needed is:

SUBROUTINE USERC1
COMMON/USER/BUF1, BUF2, LEN1, LEN2, IERR
INTEGER BUF1(64), BUF2(64), LEN1, LEN2, IERR
INTEGER SUFFIX
DATA SUFFIX/6H000 /
CALL SMOVE*(BUF2,1,BUF1,1,LEN1)
CALL SMOVE(BUF2,LEN1+1,SUFFIX,1,3)
RETURN
END

*SMOVE is a routine that has the following form:

CALL SMOVE (buf=1, start-1, buf-2, start-2,len)

buf-1 - address of the variable to which a string is moved start-1 - displacement (in characters) within buf-1 where the "MOVED" string will start

buf-2 - address of the variable containing the string to move start-2 - displacement (in characters) within buf-2 where the string

start-2 - displacement (in characters) within buf-2 where the string begins

len - # of characters to be moved

Example

buf-1 A B C D E F G H buf-2 b b b D E F b b

To move the string "DEF" into the position indicated in buf-2, the following SMOVE call is required:

CALL SMOVE (BUF2,4,BUF1,4,3)

SMOVE is available within the Translator library.

Example: A common use of user-supplied conversion routines might be the preservation of alphanumeric items when a) the source item length is greater than the target item length, and b) the item values are right justified.

Suppose a target item called POPULATION (data type character, length6)

is to be assigned from a source item POPULATION-OF-CITY (data type character, length 10). The desired result is:

POPULATION-OF-CITY
2 7 6 3 0 0

target item POPULATION 2 7 6 3 0 0

However, if no conversion routine is supplied, the actual result will be:

___276300 PARAMATAN TANDER 27

To avoid the unwanted truncation, a user-supplied subroutine must be used. The corresponding TDL clause might read:

POPULATION-OF-CITY ASSIGN TO POPULATION CONVERT WITH REJUST,

where REJUST refers to the following subroutine:

SUBROUTINE USERC2 COMMON/USER/BUF1, BUF2, LEN1, LEN2, IERR INTEGER BUF1 (64), BUF2 (64), LEN1, LEN2, IERR INTEGER START START. = LENT-LEN2 + 1 CALL SMOVE(BUF2,1,BUF1,START,LEN2) RETURN END

In this case, START = 10-6+1=5; six characters will be moved from BUF1 to BUF2, the fifth through the tenth, producing the desired result. Note the use of the Translator-supplied routine SMOVE as in the previous example. The subroutine USERC2 must be compiled into an object file, which is then inserted into the Restructurer R* file in a program link called REJUST. Again, the reader is referred to Section 8.7 for details.

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Aftern grange transferences and an experience 4.3 TDL Syntax Summary

TARGET RECORD STATEMENT TARGET RECORD target-record-name [TOLAP STATEMENT]

A TDL description must contain exactly one TARGET RECORD statement for each target database record type.

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B. TDLAP STATEMENT

TDLAP tdlap-name integer [target-item-name = $\{float \}$]ⁿ [SOURCE RECORD STATEMENT]

Rules

- Tdlap-name is 1-12 characters, unique over all TDLAP statements in the TDL description.
- Each target-item-name specifies a target item which is to be assigned the specified value in each target record instance created using thes access path.
- SOURCE RECORD STATEMENT

SOURCE RECORD source-record-name [ID=identifier.]

ACCESS VIA source-set-name [FROM ID=identifier_]

OWNER/MEMBER MEMBER/OWNER [{ACCEPT} IF NULL] [ACTUAL DATA IN ORDER] [ITEM STATEMENT] [BLOCK ASSIGNMENT STATEMENT]

Rules

- If source-record-name a-pears in any other SOURCE RECORD statement on the TDLAP, the "ID=" clause must be used.
- 2. Identifier is 1-12 characters in length, and must be unique over all identifiers specified on the TDLAP.
- 3. source-record-name must be the owner or member record type for source-set-name.

- 4. If source-record-name is the owner record type for source-set-name, then at least one SOURCE RECORD statement containing the member record type for source-set-name must appear previously on the TDLAP. If source-record-name is the member record type for source-set-name, and source-set-name is not system-owned, then at least one SOURCE RECORD statement containing the owner record type for source-set-name must appear previously on the TDLAP.
- 5. If more than one such SOURCE RECORD statement has appeared, the "FROM" clause must be used, and identifier must be the identifier specified for the desired parent node.
 - 6. If source-record-name is both the owner and member record type for source-set-name, the MEMBER/OWNER, option must be used.

 OWNER/MEMBER
 - 7. REJECT IF NULL is assumed if the {ACCEPT}option is not used. REJECT

"ACTUAL DATA IN ORDER" Rules

- 1. The actual data items in the source record type must correspond 1-for-1 and in order with the actual data items in the target record type. Primary key items in the source record must correspond 1-for-1 with primary key items in the target record. No target actual data item name may appear in an item assignment statement on the TDLAP.
- 2. Each source actual data item must have the same length and pad character as its corresponding target actual data item.
- 3. ACTUAL DATA IN ORDER, when it is used, must be the first, and may not be the last, item statement in a SOURCE RECORD statement.

2. Each torquet-foom-mand apecifies a barget foom

D. ITEM STATEMENT

Source-item=name

[SELECT IF op VALUE STATEMENT]

[WHEN QUALIFIED BY link-name [(VALUE STATEMENT)]]

[ASSIGN TO [target-item name
[CONVERT WITH routine-name

[NULL VALUE = [integer]
]

(THRMSYMEE THEMBETZER MINIS

Rules

- . See Figure 4-5, page 4-8 for implicit item conversion rules.
- 2. If ACCEPT IF NULL is used in any SOURCE RECORD statement on the TDLAP, source-item-name may not be the name of a set-significant item.
- A target record instance is created if and only if all comparisons specified on the TDLAP are satisfied.

- 4. Results of comparisons are unpredictable if the quantities compared are of different lengths or data types.
- NULL VALUEs must be specified for all item assignment statements when ACCEPT IF NULL was used in the SOURCE RECORD statement, and cannot be specified for items belonging to REJECT IF NULL source records.
- 6. See Section 4.2.3 for a detailed description of the interface to user-supplied qualification and conversion routines.

BLOCK ASSIGNMENT STATEMENTS:

SET-SIGNIFICANT DATA BY NAME OTHER DATA BY NAME ALL DATA BY NAME

Rules

- SET-SIGNIFICANT DATA BY NAME is used to assign values to all the set-significant items in a target record that have not yet been assigned values. Each of the target record's remaining set-significant items is assigned the value of the source record's set-significant item of the same name (which must exist).
- 2. OTHER DATA BY NAME has the same effect as SET-SIGNIFICANT DATA BY NAME, except that it causes every target item not previously assigned to be given the value of the source item of the same name. This applies to both set-significant and actual data items. OTHER DATA BY NAME, when used, must be the last item assignment statement on the TDLAP.
- 3. ALL DATA BY NAME causes every target item to be assigned the value of the source item of the same name. When used, it must be the only item assignment statement on the TDLAP.
- 4. If ACCEPT IF NULL is used in <u>any SOURCE RECORD statement</u> on the TDLAP, BLOCK ASSIGNMENT statements may not be used.

E. VALUE STATEMENT

integer
float
literal
source-item-name
 [FROM source-record-name [ID=identifier]]

Rules

- . source-item-name may <u>not</u> be the name of a set-significant item if ACCEPT IF NULL is used with <u>any</u> SOURCE RECORD statement on the TDLAP.
- 2. The "FROM" option must be used if source-item-name does not belong to the same source record as the item to which it will be compared. Source-record-name must have appeared previously in a SOURCE RECORD statement on the TDLAP, and if it appears in more than one SOURCE RECORD statement, its identifier must be given.

5.0 RUNNING THE IDS ANALYZER

Once the user has prepared his/her source and target database extended IDS MD sections (see Section 3), it is necessary to convert these textual database descriptions into the tables used by the Data Translator. These tables, the Stored Data Definition Language tables (SDDL), contain all of the information necessary to describe the source and target databases. This process of conversion is performed by executing the IDS Analyzer twice, once for the source database(s) and similarly, once for the target database(s). As described in Section 3, the general processing flow is as follows:

- Initialize temporary IDS database for use by IDS Translator in query mode.
- 2. Run IDS Translator in query mode, inputting the prepared extended IDS MD section and outputting the IDS Query dictionary.
- 3. Read the IDS Query dictionary as input to the IDS Analyzer and output SDDL tables and reports.

The above sequence is done twice, once for the source database(s) and again for the target database(s).

Before executing the IDS Analyzer, the following must be performed.

- 1. An extended IDS MD section has been written. All rules specified in Section 3 of this User Manual must have been obeyed. Furthermore, as recommended in Section 3.2.1 Rule #1, the IDS MD section prior to augmentation with level 61 entries should be compiled by the IDS Translator into a dummy COBOL-IDS program so that all IDS or COBOL errors can be removed.
- 2. A permanent file (random) must be created to hold each SDDL table database (one for the source, one for the target). A rule of thumb to use in creating the file is

4 11 inks/01 record

3. The first card of the extended IDS MD section must be an IDS QUERY card. "IDS QUERY" must begin exactly in column 8. All cards starting with "MD" must be removed. Hence an extended IDS MD section will look like the following prior to IDS Analyzer execution. No line within the extended MD section may extend beyond column 72. Additionally, if the extended MD section is in a file, tab characters of ":", """, ",", ";" should not be used under any circumstances.

co1 72 col.8. RESTRIKE THE THE ANALYZER Sebred IDS QUERY I Secret Link admine sentrick by secret and sent sent and Pant 01 record trevers as weaklessen at it .(2 mottes en contract de l'estat de l'estat en l'estat 70 02-49 plus level 61 entries 98 entries deady the an at worth prince the general prince at the as follows: "Ol record .. . 201 we say not saedstab 201 yearmost years form of . elon visuo 02-49 plus level 61 entries 98 entries a finite years hat ear cartificates the mortices CA 201 these three the County distinguity as invested the 105 analyzed and occurs the could her suggest areas Of record is tab somes and not econ .esive sont of econoce sont (classification deposit of) 02-49 plus level 61 entries th Section 1 of this Beer Manual cast have been charged in the the notice of the contract of t the free on the beauty the transfer of the state and the section of the transfer of the transf The dark electroping 201-10000 versus a most resistant till set yo havener of men every 10000 at 201 A personnel this (the course of extents to act a acts each such that database tone to the source). A rule of

Figure 5-1
Extended IDS MD Section

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beyond column 12, Add theslip, if the extended HD section is if a file til, the characters of "" " " " " " " " " " " " " should have been under any circumstances.

5.1 Detailed Overview of IDS Analyzer Execution

Executing the IDS Analyzer requires four activities as shown below.

Activity

- 1 Initialize IDS Query dictionary database via QUTI
- 2 Execute IDS Translator in query mode, which produces the IDS Query dictionary from the extended IDS MD section
- 3 Execute phase 1 of the IDS Analyzer which produces SDDL tables for groups, items, and relations
- Execute phase 2 of the IDS Analyzer which completes the SDDL tables by adding set-significant items and finally produces two dumps of the SDDL tables in report form.

The entire process is illustrated in Figure 5-2. Each component is explained below.

IDS QUTI

Invoked in activity one via a \$PROGRAM QUTI, this program initializes 360 database pages of a temporary IDS file, the Query dictionary.

IDS Query dictionary A 360 page (320 words/page) temporary IDS database, initialized in activity one by QUTI and populated in activity two by the IDS Translator. The Query dictionary is an IDS database containing information on user databases (IDS, ISP or sequential). Its internal format is completely described in the IDS Data Query Installation Guide. Other relevant information on the Query dictionary is contained in Section 3.1 of this User Manual.

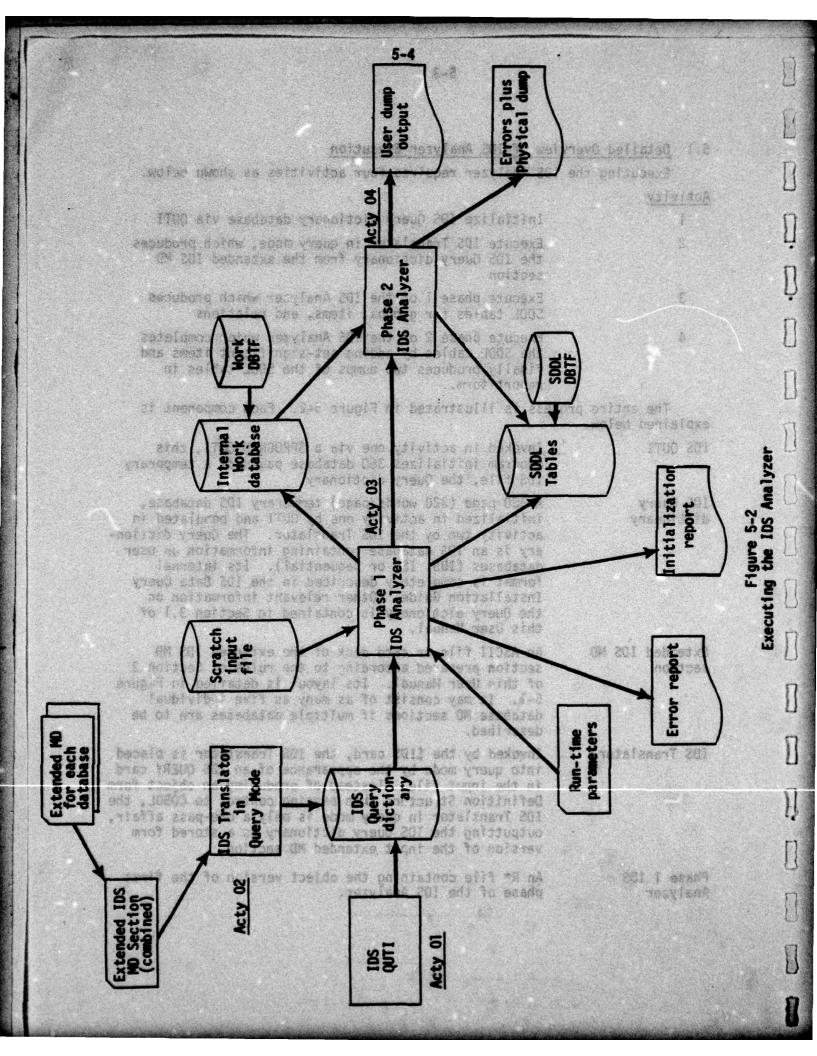
Extended IDS MD section

An ASCII file or card deck of the extended IDS MD section prepared according to the rules of Section 3 of this User Manual. Its layout is detailed in Figure 5-1. It may consist of as many as five individual database MD sections if multiple databases are to be described.

IDS Translator

Invoked by the \$IDS card, the IDS Translator is placed into query mode by the appearance of an IDS QUERY card in the input file. Instead of producing an object form Definition Structure then passing control to COBOL, the IDS Translator in query mode is only a one-pass affair, outputting the IDS Query dictionary as a stored form version of the input extended MD section.

Phase 1 IDS Analyzer An R* file containing the object version of the first phase of the IDS Analyzer.



Phase 2 IDS An R* file containing the object version of the second phase of the IDS Analyzer. Analyzer An ASCII file with the information on which database Runtime parameters and records are being analyzed. See Section 5.6 for complete details. A null-linked file that must be attached for use by Scratch input file the ADBMS system. SDDL tables An ADBMS database containing the Data Translator representation of the user database(s). One SDDL tables file is sufficient for up to five source or target database descriptions. Source SDDL tables are used by the Reader, TDL Analyzer and Restructurer. Target SDDL tables are used by the TDL Analyzer, Restructurer and Writer. The database tables file describing to ADBMS the format SDOL DBTF and contents of the SDDL tables database. See Appendix A temporary ADBMS database sed to communicate information between phase 1 and phase 2 of the 100 Analyzer. Internal Work database Once the IDS Analyzer is finished, the Internal Work database is no longer needed. Work DBTF The database tables file which describes to ADBMS the format and contents of the Internal Work database. as bearers at washold See Appendix F. A list of all syntax and semantic errors appearing while Error report executing phase 1 of the IDS Analyzer. See Appendix A for a complete listing.

Initialization report

A report indicating that the SDDL and Internal Work databases have been initialized by ADBMS.

User dump report

Major output of the IDS Analyzer (report-wise). Contains a list of the contents of the SDDL tables. Should be used as an aid in writing TDL (see Section 4).

Errors plus physical dump

ords which ere linked

Any errors occurring during phase 2 of the IDS Analyzer are printed along with another report dumping all of the fields in the SDDL tables.

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5.2 Explanation of Processing Flow

This section comprises a brief overview of the algorithms, input and outputs of the entire IDS Analyzer. Note that the whole process must be performed once for the source database(s) and again for the target database(s). Each activity is described in turn with a complete JCL description given in later sections.

() SE chain despit entries are measured to Datail Definition records.

hos chiphel to pederstand condition to the Query distingent is consensited. It is drefer to the feeth the pesse second Services second Services the Services of the Services o

5.2.1 Activity 1 - Initialize Query Dictionary

Inputs

. The Court of the

- 1. IDS directives to
- detabase desporary IDS detabase detabase detabase
- b) initialize a temporary un en database sets od trim tolt elle heanflellun & alle sugar derroc

1. An initialized temporary IDS

The desirence amount and

Algorithm

Three hundred sixty database pages have the page header record placed on them. To prompt serve on tou and the but thus at all

5.2.2 Activity 2 - Create IDS Query Dictionary

database dewertridans. Source 1991 taking are used by

Inputs

Outputs

- athered database est and reliant Mile and to ather not one
- 1. Initialized temporary IDS 1. Complete IDS Query dictionary

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And Lyder!

TORR NOW

- 2. User-prepared extended IDS MD Internal Work A Lemborary AREMS database used to communities aforms
- 2. Execution report
 - 3. IDS directive specifying attributes of the temporary database

and an Algorithm races come of the earlier seed stop of

For purposes of the IDS Analyzer, the Query dictionary is created as follows:

- a) 01 records are mapped to Record Definition records.
 - b) 02 items are mapped to Field Definition records and the immediately following Validation records.
- c) 03-49 entries are mapped to Validation records which follow the Validation record for the 02 item beneath which the 03-49 entries appear. Should be
- d) level 61 entries are mapped to Description records which are linked to the Validation record for the 02-49 entry beneath which the 61 level appears. cond fastawis
 - e) 98 chain master entries are mapped to Master Definition records.
 - 1) 98 chain detail entries are mapped to Detail Definition records.

There are other record types within the Query dictionary as well as other processing, yet as far as the IDS Analyzer is concerned, that information is ignored, your stock and tack each . Yesyland 201 evides end to expecte

Exemple stranged and alega and (2) exemple downer and to see the terror exemple stranged at yet accompany to the sum of the exemple of the second at the sec Suppose that Figure 5-3 is the extended MD section. Figure 5-4 shows the Query dictionary after activity two has been executed. While it is not critical to understand completely how the Query dictionary is constructed, it is useful to be familiar with the basic Record Definition, Field Definition, Validation and Description structure so that IDS Analyzer errors can be correctly interpreted.

IDS QUERY

OI CITY TYPE IS I RETRIEVAL VIA CALC CHAIN.

02 CITY-NAME PIC X(15).

02 DEPARTMENTS SIZE 100.

03 CITY-DEPTS OCCURS 10 TIMES SIZE 100.

61 OCCURS 10 TIMES.

04 DEPT-NAME PIC X(10).

61 EOG.

other 02-49, 61 entries

98 CALC CHAIN DETAIL RANDOMIZE ON CITY-NAME.

98 HAS-OFFICIALS CHAIN MASTER CHAIN-ORDER IS AFTER.

01 OFFICIALS TYPE IS 2 RETRIEVAL VIA HAS-OFFICIALS CHAIN.

02-49 + 61 entries

98 HAS-OFFICIALS CHAIN DETAIL SELECT CURRENT MASTER.

Figure 5-3
Sample extended IDS MD section

5.2.3 Activity 3 - Execute IDS Analyzer Phase 1

Inputs

Outputs

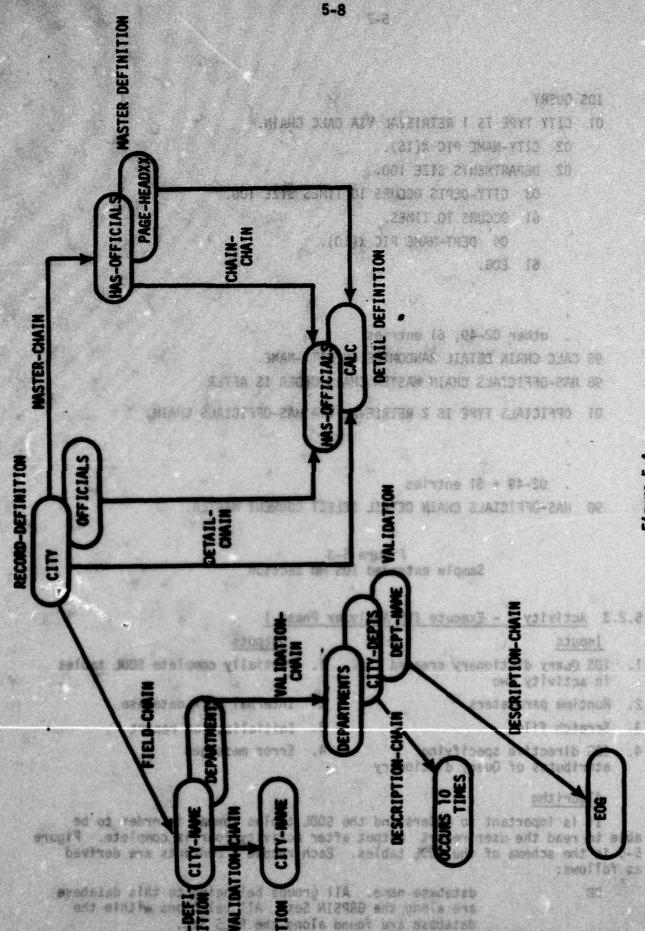
- 1. IDS Query dictionary created in activity two
- 2. Runtime parameters
- 3. Scratch file
- 4. IDS directive specifying attributes of Query dictionary
- 1. Partially complete SDDL tables
- 2. Internal work database
- 3. Initialization report
- 4. Error messages

Algori thm

It is important to understand the SDDL tables format in order to be able to read the user report output after activity four is complete. Figure 5-5 is the scheme of the SDDL tables. Each record's contents are derived as follows:

DB

database name. All groups belonging to this database are along the GRPSIN Set. All relations within the database are found along the RELS Set.



Query dictionary for MD section from Figure 5-3

GROUP Each 01 record and contained-in-repeating group has a GROUP record for it. The relations of which the group is a member are found along the RELMEM set. The relations of which the group is an owner are

found along the RELOWN set.

ITEM Each user field is represented by an ITEM record. All the ITEMS for a GROUP are linked together on the ITEMS set. Set-significant items for a relation are linked together via the HASSIG set.

RELAY Every relation defined by the user (chain, concatenated, match-key or phantom pointer) has its own RELAY record.

The owner of the relation is found by heading the RELOWN set. The member of the relation is found by heading the RELMEM set.

The basic processing flow of the IDS Analyzer phase 1 follows.

1. Start at the first Record Definition record in the Query dictionary

- a) Create a GROUP record for the Ol record.
- b) Create RELAY records for all chains of which this record is master.
- 2. For each Field Definition record of the above Record Definition
 - a) Create an ITEM record for the 02 entry. or
 - i) Get the Validation record if 02 entry is for a group.
 - ii) Locate the 61 OCCURS XX TIMES and create a GROUP record.
 - iii) Get succeeding Validation records for the items of the contained-in-repeating group. Create ITEM records for each of these.
 - b) Link the ITEM records up to the ITEMS set.
- 3. For the 02 TRANSLATION-INFORMATION and following level 61 entries
 - a) Store primary key information in Internal Work database.
 - b) Create new RELAY records for the specified phantom or matchkey relations. Link sets.

The above process is repeated for every Record Definition record. While the user is certainly not expected to fully understand the details of the IDS Analyzer it is useful to have an overview of the process so that error messages can be interpreted. Many details were left out of the above description so that a basic picture can be given.

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see the method responses to the plant of the properties and edition to controller out out that the per 10000 is seement of the grand are to the seement of the seement and nemer to at more and halos to entitle and

the obeyes this may be made any as press that DIA THE HOLD HAVE AND HARRY ON A ROLL AND BUTTLESS set. Sethesignificant came for allegants to take a categories with the cASSIG set.

Every relation differed by the user (chair, generated, AND THE PROPERTY OF THE PROPER

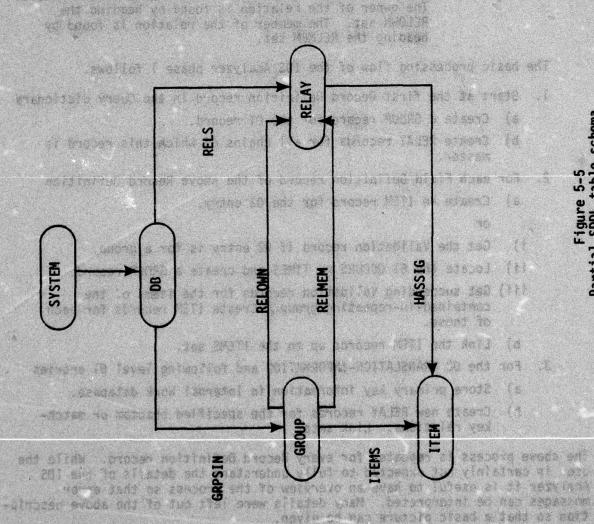


Figure 5-5 Partial SDDL table schema

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5.2.4 Activity 4 - Execute IDS Analyzer Phase 2

Inputs 1. Internal Work database 1. Complete SDDL tables 2. Partially complete SDDL tables 3. Error messages 4. Physical dump of SDDL tables

Algerithm

During activity three, the IDS Analyzer collected all user-supplied information on orimary keys in the Internal Work database. Phase 2 of the IDS Analyzer takes this information along with the partially complete SDDL tables (all groups, relations and user items) and creates set-significant items for the proper groups. These are then linked up to the relations (e.g. sets) for which they are significant. Once the entire SDDL tables file is complete, the two dumps are produced.

5.3 IDS Analyzer JCL

Control cards for executing all four activities are illustrated in Figure 5-6. This sequence of control cards is available on the SYSGEN tape containing the Data Translator (see Appendix G). Notes concerning the control cards are stated below where a control card is not self-explanatory.

Eine no.	Meliarks
0150	At this point, the user file containing the extended MD section must be placed. Note that the file must be ASCII.
0230 Service (1875)	This is where the R* file for phase 1 of the IDS Analyzer is inserted.
0280	Supplied on the SYSGEN tape is a random library containing a variety of Translator routines used by multiple Translator Main Modules. This file must be available at load time.
C290	Attached here is the PRMFL for the SDDL tables data- base file. See Section 5.0 for guidelines on creation. Note that the SDDL tables file is <u>different</u> for the source and target database(s).
0300	Supplied on the SYSGEN tape is the DBTF for the SDDL tables database. It must be available at execution time.

Figure 5-0 Complete 105 Analyzar Control Carde

```
2010
            IDENT
                  *************
0000
            NOTE
      S
0030
            NOTE
                       INITIALIZE QUERY DICTIONARY
2400
      $
            NOTE
                  *************
0000
      $
            PROGRAM OUTI
            FILE
                                ASIGN JONE QUERY DICTIONARY FILE
0060
      $
                  A1.X15.30R
0070
      5
            DATA
                  1*
0080
      IDS
            INITIAL 1.360
0090
                  .0
      S
            DATA
      IDS
                  FC/A1/. BSSZ/360/. RNG/1.360/. INV/NO/
2100
            CREATE
1110
            NOTE
                  ***************
1120
            NOTE
                  *
                       CREATE IDS QUERY DICTIONARY
3400
      $ NOTE ***************************
                 * NDECK: 3404 Temetal SSI at Eyes standing he has an
1140
      $ IDS
1150
      S SELECTA EXTENDED WITH LEVEL 61'S 4D SECTION
      S FILE 2 3.X15
1160
1170
      $ DATA DE DATA DE OU DE MAIT BAS SESSES DE COME
3180
      IDS CREATE FC/*3/.855Z/360/.RNG/1.360/.INV/NO/
1190
      S
            NOTE
                  *****************
1200
            NOTE
                       EXECUTE IDS ANALYZER PHASE 1
1400
            NOTE
                  ***************
0210
            EXECUTE NREST
                  25. 64 K.-2K.30000
            LIMITS.
3220
      S
                  R*.R.S.PHASE | IDS ANALYZER R*
      $
            PRMFL
,230
            FILE
                  H*.X2R.50R
1240
3250
      $
            FILE
                  AT.XIR QUERY DICTIONARY
      S DATA
3200
                  .0
      IDS
1210
            CREATE
                  FC/A1/.BSSZ/360/.RNG/1.360/.INV/NO/
                                                  Spp. sell
0220
      $
            PRMEL
                  TR.R.R.TRANSLATOR LIPRARY
0290
      SPRMFL
                  03/ZIS.W.R. SDDL TABLE FILE
      S PRMFL 04.P.S.SDDL DRTF
0300
                                   SCRATCH FILE
2312
            FILE
                  05. X 3R
3320
      $
            REMOTE
                  06
                                         INITIALIZATION OUTPUT
         FILE
                  15.X4S.10R INTERNAL WORK DATAPASE
3330
      5
3340
            PRMFL
      S
                  16.P.S. INTERNAL WORK DATE
1350
            REMOTE
                  A3
                                         ERROR MESSAGES
2300
            DATA
                  A5
3370
            SELECTA
                  RUN-TIME PARAMETER FILE
       NOTE
NOTE
3350
                  **********
3390
                       EXECUTE IDS ANALYZER PHASE 2
      $
        NOTE
100
                  *****************
1410
      $
            EXECUTE
0420
      S PRMFL
                  R*. P. S. PHASE 2 IDS ANALYZER R*
1430
                  H*.418.108
     INSTRUMENT FILE TO
                               was rain assu
                  15.38K.-1K.15000
0440
      S LIMITS
                  TR.R.R.TRANSLATOR LIBRARY
1400
      $
            PRWFL
                  O3.ZIR

SDDL TABLES
SDDL DUMP AND EPROR MESSAGE
0450
      S
            FILE
      SPENOTE
3410
                  07 and sale sales at the sales and SDDL DIMP
      S REMOTE
480
                                      INTERNAL MORK DATARASE
1400
            FILE
                  15.X4R
1000
            ENDJOB
```

Figure 5-6
Complete IDS Analyzer Control Cards

3							
ri Line no.	Remari	<u>u</u>					
U 0340	Internal Wor	Supplied on the SYSGEN tape is the DBTF for the Internal Work database. It must be available at execution time.					
Ü 0370	(described i	The ASCII file for the run-time parameter file (described in detail in Section 5.7) is supplied beneath the \$DATA A5.					
Ų 0420 ¥	See comments	s for line 0230.					
0450	See comments	for line 0280.					
5.4 IDS Analyzer	- Activity 1						
0010 \$ IDENT 0020 \$ NOTE 0030 \$ NOTE 0400 \$ NOTE	* INITI	**************************************					
0050 \$ PROGRAM 0060 \$ FILE 0070 \$ DATA 0080 IDS INITIAL 0090 \$ DATA	A1.X15.30R I* 1,360	QUERY DICTIONARY FILE					
J100 IDS CREATE	FC/A1/,8552	/360/,RNG/1,360/,INV/NO/ Description					
A1 E	x1s	A temporary random file for holding the IDS Query dictionary. Must be at least 30 random LINKS in size.					
I *		Input to QUTI, specifies initialization directive which must be IDS INITIAL 1,360.					
		Input to IDS, indicates that a temporary IDS database is being used. Directive must be IDS CREATE FC/A1/,BSSZ/360/,RNG/1,360/,INV/NO/.					
User parameters							
None Symple of output							

Example of output

Figure 5-7 is sample output from QUTI. It is the standard IDS initialization report. Be sure to note that LLINKS ALOC=LLINKS NEC=360.

|--|

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Error output

Any occurrence of an error will be indicated on report code 74, filecode P*. Typical errors are incorrect INITIAL or CREATE directives. Appropriate action is to correct and rerun.

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5.5 IDS Analyzer - Activity 2

11	3110 \$	NOTE *****************************
U	0120 \$	NOTE * CREATE IDS QUERY DICTIONARY
	0400 \$	NOTE ****************************
	3140 \$	IDS NDECK
D	2150 \$	SELECTA EXTENDED WITH LEVEL 61'S MD SECTION
	3160 . \$	FILE *3.XIS QUERY DICTIONARY

20000000	Marie S	3000000000				Source Starting Land		nenaen.	92ma1550r204	SECTION AND SECTION OF THE PARTY OF THE PART	SECTION AND ADDRESS.	SIMPE (2025	UNESCOUNTED										
JEE 274	DESCRIPTION	-		STATE OF THE STATE		Phillips Street Show	Children and Children			Second Section 10	93.96 TO FSE	terriff breeze		C-12 (1) 12 (1) 12 (1)			- California	THE REAL PROPERTY.	400 miles (500)	STATE OF STREET		45 840	121212 B 122
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247/30	SE 107	_ र आह		40000 IS 09	862 8333	88 985 T.J.	_ 167 TE 150		2 1654	Alb 45.	or also es	- Share	~ Y AV A	255C. 1 to 1 ti	B DF ARREN	60 T 4 T 1	S. F. 400	22570,0000	I to \ OF F A	COLUMN T	1 6 50	A 1 W	W 400000
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* (04) % 519

*1C1K

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FI	lecode		LUD	Description
*	3	91121 60	OXIS TIVETO	The initialized IDS Query dictionary is
				populated by the IDS Translator in query
		.00 3518	ABAIT E AM	mode in this activity. It must be
				attached to filecode *3.
	Q			All jobs that use a temporary IDS data-

All jobs that use a temporary IDS database in several activities must respecify . AVE 3912 29411 S 20102 the IDS CREATE directive for each activity in which the IDS database appears. Note that the directive is identical to the one for activity one except that FC/*3/ is used instead of FC/A1/.

435 T

SHIP) SHEWAY LOOP TO CL

-- Input to IDS Translator in query mode, e.g., the extended IDS MD section. The control card sequence illustrates a technique for inputting an ASCII file containing the extended MD section via a SSELECTA card.

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CYZZ OR PICTURE CCAUSE RINARMA PROMINADUS 84

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.003 10

User parameters

None

S. S

Example of output

The IDS Translator in query mode will produce on report code 74, file code P*, three sets of output.

- a) A source listing plus errors of the extended IDS MD section.
- b) A utilization report for filecode *3.
- c) IDS subroutine statistics used to create the Query dictionary database.

France 5-K Accorded & Output

Only the output for (a) is illustrated in Figure 5-8.

				5-1	6 27-2	
260T 02	10-28-76	17.824	HIS	600	INTEGRATED DATA STORE TRANSLATOR	SR 1
DS ALTER	NOS.					
0001	O1 THE	-UNIVERSE	TYPE	IS 1	CARRIE 70921	
10005					The manual me is an entertain an area	
00003	. 02				(CLO) - The control of the control o	
0000	02				2 TIMES SIZE 48. 1208 418 TOTAL	
10005	61				-	·
90006		03 MIL				
00007					X(5). S PIC 9(8) COMP-1.	
80000	61	EOG.	IDEN OF	STAN	**************************************	DITT
00009	02	THE-DIP	ERS PI	C X (2	10) OCCURS 2 TIMES.	0.510
00011	**********	OCCURS 2			name and the second of the second	COAC
00012	61	EOG.	100 (100 (100 (100 (100 (100 (100 (100 	W. 188	· AVEIDA CALL	
06013	02	SOLAR-SY				
00014	THE HOLD BY	02 ASTER				UD45-
00015	•				KS OCCURS 3 TIMES SIZE 72 .	0810
00016			CURS 3			
00017					PIC X(3)	
00019	el secondo el				FIC-GRAVITY PIC 9(12) COMP-2.	
00020	recorded Water	61 E	G.	50.000		
00021	. 02	PLANETS-	OF-THE		OCCURS 9 TIMES SIZE 90.	
00022	61	OCCURS S				
00023	- 12 mg 61	DO-NOT-F				
00024	Programme tracks	The second secon	-or-PL	ARET	Pic X(10).	
00025	61 02	EOG.	PES-DE	-FA01	TH OCCURS 2 TIMES SIZE 390.	
00026	COLUMN TO A COLUMN TO SELECT TO SELECT THE S	UCCURS 2			3,000,000	
00028		3 CONTIN			(5).	
00029		3 COUNT	RIES-ON	-CONT	TINENTS OCCURS 5 TIMES SIZE 190.	
00030			STIP			
00031	SDOM WHOLE				TRIES PIC X(10).	
00032					TES PIC X(10)CITIES OCCURS 3 TIMES SIZE 18.	
00033	ASCIL FILE		CURS 3			
00034	Siri silea	05			C X(2).	
00036	M = 1				(C X(2).	
00037		05	THE-UG		IC X(2).	
00038		61 E0	6.		the or executions	
00039		51 F.06.				
00040	61	EOG.		ECD	PROP.	
00041	02	TRANSLA			M ABOVE 02	
***** 512	COR PICTUR		W1997M	T. C. C. T. P. S. F. F. S. C.		****
00042	61	P-K.	30.00		CONTRACTOR OF THE PROPERTY OF	
00043			-UNIVER	351	code Po. Chree sets of oursuit visit	
00044	noi:61	T: UNT	VERSE-N	APE.	. a) A source listing plus errors	
00045	61		-GALAXI	ES.	5) A stilization report for file	
00046	62	EURUFS				
00047		THE-UNIV	ERSE/ON	N3/T	c) III subroutive statisticAP+3H	
30048		LAXIES.	en (Dece			
00050	61	E-K-F:	PATTER	rhi	Only the output for (a) is illustrated	
00051		THE-UNIV	ERSE/OW	NS/T	HE DI .	
00052		PPERS.				
-				Figur	re 5-8	All the second of the
The state of the s			. Ac		y 2 Output	

Error Witgut

	1-28-76 17.824 To anil result and 18. respect block and	TOS COERY CARD ON	. detected 35 M2 section.
053		SPHERES-OF-EAR	THO SUPER THE TREETS AND THE
054	61 E-K-F:		weeks are with
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056 057	61 G:		Campon Elitor
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060		IERES-/OWNS/COU	
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062 063		ANTS-OF-CITTES	
064	THE RESERVE OF THE PROPERTY OF		
065	に対しては、1000年に、東京の東京の東京の東京の東京の東京の東京の東京の東京の東京の東京の東京の東京の東	LES-ON/OMNS/INH	ABI
066	61 TANTS-		modelgrant 20% and ad because of
067	98 CALC CHAIR	TTE ON LINIVERS	E-NAME.
ERE WERE	000001 WARNING	FLAGS IN THE A	BOVE IDS TRANSLATION
			- Contract limits
	notoosi	heavited to theed	Error to essended NO Section
124	ANESTED IN SECTION	a meranical	Lastab (efeve not most & .1
	The state of the s	.000	the potent plant to early
			eattine DETAIL entries
	ividas ai odižuks.	place of water or an other program of the	as a more mast vessemela sa S

2 Jon of Jest yaths CA-CG and States of the CR and the

innervery (30 Analyses outpot: The

entry is charge tradesments a field Certarilles record Latergrap to an antirely different record type.

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Error Output

Any flagrant or easily detectable syntax errors are denoted by the IDS Translator in query mode. All are self-explanatory. Common errors are:

1. REQUIRED IDS QUERY CARD MISSING

ASH.XI 87-08-01 10-10-16 User did not include the IDS QUERY card as the first line of the Cause: extended IDS MD section. Alternatively, the rigid format of IDS Query starting in column 8 was not observed.

Correct and rerun. Action:

2. SIZE OR PICTURE CLAUSE MISSING FROM ABOVE 02

Either Cause:

> a) A "SIZE O" was not added to an O2 TRANSLATION-INFORMATION entry, or **有了的**自己有关与不是

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b) An O2 COBOL group was defined without a SIZE clause. See Section 3.2.1 for rules in placing SIZE clauses.

Action: Correct and rerun.

Some errors, detectable by the IDS Translator in normal mode, cannot be detected by the IDS Translator in query mode. These errors will lead to unpredictable results. The following is a known list of errors that are not detected by the IDS Translator in query mode with the corresponding known result.

Error in extended MD Section

- 1. A loop (or cycle) defined with 98 CHAIK MASTER and 98 CHAIN DETAIL entries.
- An elementary item whose size 2. is larger than maximum allowable by IDS.
- 3. A 03-49 entry that is not placed underneath an 02 entry.

Result of non-detection

ESTATE-TO-STURFIGHT IN

- I8-RUNTIME-EXHAUSTED in activity two.
- 18-RUNTIME EXHAUSTED in activity three. Impossible to detect in activity three since Query dictionary is built incorrectly.

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Incorrect IDS Analyzer output. The Validation record for the errant 03-49 entry is placed underneath a Field Definition record belonging to an entirely different record type.

DIPO S NOTE		***********
)200 \$ NOTE		TE IDS ANALYZER PHASE 1 *
3210 \$ EXECU	TE NREST	
D220 \$ LIMIT D230 \$ PRMFL	S 25.64 K2K.	.30000 USE APPROPIATE CORE RE
0240 \$ FILE 0250 \$ FILE	H*, X2R, 50R	599101 30
0260 \$ DATA	Al.XIR	
1270 IDS CREAT 1280 S PRMFL		/360/.RNG/1.360/.INV/NO/ SLATOR LIBRARY
D290 PRMFL	03/Z15.W.R.S	SDDL TABLE FILE
0300 S PRWFL		DBTF SCRATCH FILE
0320 \$ REMOT	E 06	INITIALIZATION OUTPUT
)330 \$ FILE)340 \$ PRMFL		INTERNAL WORK DATABASE
)350 s REMOT	E A3	ERROR MESSAGES
)360 S DATA	A5 TA RUN-TIME PAR	DAWETER FILE
(Notes Existence)	efit independ sa	er established
Filecode A	ar atmy <u>LUD</u> in se	<u>Description</u>
R*		
		Phase 1 IDS Analyzer R* file from the SYSGEN tape.
no Her and a sea	X2R	SYSGEN tape. Required filecode so an entry can be
		SYSGEN tape.
as pp. 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2 1/2		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in
		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two.
		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition
		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition
A1		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition of "R". Directive to IDS describing the attributes of the temporary IDS Query dictionary
Al		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition of "R". Directive to IDS describing the attributes
A1		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition of "R". Directive to IDS describing the attributes of the temporary IDS Query dictionary database. Its format is identical to the directive in activity one. Random library of Data Translator object
A1		Required filecode so an entry can be made in PAT. Must be a random temporary file. IDS Query dictionary file initialized in activity 1 and populated in activity two. After activity three, its presence is no longer required, hence, the disposition of "R". Directive to IDS describing the attributes of the temporary IDS Query dictionary database. Its format is identical to the directive in activity one.

Filecode	<u>LUD</u>	Description ASSYTEM AND BUT
04 ************************************		Obtained from the SYSGEN tape, the database tables file (DBTF) for the SDDL tables database must be attached to filecode 04. See Appendix F for a description of the role of DBTFs
05	X3R	A null scratch file that ADBMS uses.
06 VERSON "3372 V	*\$110	Initialization and some error output for activity three.
. 15	X4S	Random, temporary file for holding the Internal Work database. 10 random LINKS are sufficient for the largest extended MD section. Must have disposition of Save since it is used in activity four.
140 1700 1845	'iw	Similar to filecode 04 is the DBTF for the Internal Work database. It is available from the SYSGEN tape.
A3		Error message output from phase 1 of IDS Analyzer.
A5	TO THE TOTAL TO TH	Run-time parameter file (described below) is selected here into \$DATA A5. It must always be available.

User parameters

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For filecode A5, the user must supply a run-time parameter file with format as follows:

column: 1 2 3	4 5 6		30	35
er file thicialized in	neidella enaut Mil-			
was entrolled * or outdoty	pe-1 * + data	base name-1		*
the right at which the right of the latter will be a second	进度一定要求证明者(K. 水路台中)			
THE RESERVE OF THE PARTY OF THE	-1 for database name			
record-name	-2 " " " " " "			

to the record-name-n for with mapping m

tion(s) processed by the 105 Analyzam Seq Section 5 0 for quidelines on changing

presentive to 135 descriping the attributes of the besponery 155 learn disciplinary descripings to details to

. * dbtype-2 * - database name-2

3 51 CS .

record-name-1 for database name-2

the directive in activity one.

ed pads billow will recemenag MENT HAN SHIT column: 35 30 record-name-n for database name-2 FERT THE UNIT BENDHERRY *TEES NACHERET - SALES 17759910 243840 5640040 dbtype-5 database name-5 record-name-1 for database name-5 32AB-A1AG-321035148A1* tuated to entomical record-name-n for database name-5 sens find he) employed NSCA hase claimed want and to Toutheans of button in appet house and come appeted to at takes the areas from the area of the come and the come and the come Appetent company parameters as an expension of the second Rules: 1. For each database being described via one combined extended IDS MD section (see Section 3.8), the name of the database, its type and the records which belong to the database must be specified. This is necessary so the IDS Analyzer has a way to tell which Ol record within a combination of several database descriptions belongs to a given database. dbtype-1 ... dbtype-5 must be either IDS, ISP, or SEQ and must be enclosed by "*" in columns 1 and 5. database-name-1 ... database name-5 can be any name (up to thirty characters in length) with no preceding blanks which is assigned as the database to which the succeeding record names will belong. 上安于安京安 安州市 record-name-1 ... record-name-n are names (up to thirty characters in length) which must be 01 entries within the extended IDS MD section. No preceding blanks are allowed. Example TKN YORK S Suppose a user wishes to describe three source databases (one ISP, two IDS) with one combined extended MD section. Each database contains the following records: diskup din di ISP GROWN 1000 P IDS #1 IDS #2 TEARATAC INVENTORY AIRCRAFT PEOPLE WAREHOUSE **MANUFACTURERS** ADDRESS-DATA

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The run-time parameter file would then be:

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INVENTORY WAREHOUSE

*IDS*AIRCRAFT-SHIPS

AIRCRAFT MANUFACTURERS SHIPS

*IDS*PEOPLE-DATA-BASE

PEOPLE ADDRESS-DATA

Examples of output

Figure 5-9 is the initialization report for the ADBMS database initializer. As noted in Appendix F of the User Manual, each ADBMS database (in this case the SDDL tables and Internal Work database) is divided into 1024 word pages and must be initialized prior to storing records in them.

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Figure 5-10 is a sample of some error output produced by the IDS Analyzer. The error message is printed followed by the IDS Analyzer's current location within the IDS Query dictionary.

Error Output

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Figure 5-9
Initialization Output - Activity 3

Figure 5-10 Output Activisty 2 Report code G1 SNUMB = 8260T. ACTIVITY # = 03. REPORT CODE = 03. RECORD COUNT = 000027

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IDS ANALYZER ERROR REPORT
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           CURRENT VALIDATION IS= NUMBER
           CURRENT 61 LEVEL IS= ECG.
         SIZE CONFLICT BETWEEN LENGTH OF GROUP AND LENGTHS OF ELFMENTARY ITEMS
           CURRENT DATA-BASE IS= COSMIC-DATABASE
           CURRENT 01 RECORD IS= THE-UNIVERSE
           CURRENT 02 FIELD IS= ASTFROIDS
           CURRENT VALIDATION IS= ROCK-SPECIFIC-GRAVITY
           CURRENT 61 LEVEL IS= ECG.
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           CURRENT O1 RECORD IS= THE-UNIVERSE
           CURRENT 02 FIELD
                              IS= ASTEROIDS
           CURRENT VALIDATION IS= RCCK-SPECIFIC-GRAVITY
           CURRENT 61 LEVEL
                             IS= ECG.
***FRROR ... SIZE CONFLICT BETWEEN LENGTH OF GROUP AND LENGTHS OF ELFMENTARY ITEM
           CURRENT DATA-BASE IS= CCSWIC-DATABASE
           CURRENT 01 RECORD IS= THE-UNIVERSE CURRENT 02 FIELD IS= ASTFROIDS
           CURRENT VALIDATION IS= RCCK-SPECIFIC-GRAVITY
           CURRENT 61 LEVEL IS= ECG.
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Figure 5-10 Output Activity 3 - Report code 03

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		. (ar)a .	OTH HTWOM 20
H*	HIR	Other . (A)E	Filecode required so that an entry can be made in PAT. Must be a random temporary file.
TR _		(01)x	Random library of Translator object routines. Available on SYSGEN tape.
03	ZIR	- (0i)x	SDDL tables database, partially completed in activity three.
06 gamma sampo	i (City	9(6) 100	Error report and physical dump of SDDL database.
07			User dump of SDDL tables database.
15 ESMIT 8	X4R	(01))	Internal Work database from activity three.

User parameters

None

Example of output

Figure 5-12 is an example physical SDDL table dump appearing on report code 06. The user need not be concerned with interpreting this output because it is used only for debugging purposes.

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However, interpretation of the user SDDL table dump is critical to successful translation (see Figure 5-13 for an example). The output is organized as follows:

- 1. Each database is listed.
 - a) for every database, the groups within it are listed.
 - b) for every group, the items within the group and the relations of which the group is a master or detail are listed.
- 2. All relations defined are listed.
 - a) for each relation, the master and detail group of the relation are printed.
- 3. All relations whose owner (master) is a SYSTEM are listed.

For illustrative purposes, a partial extended IDS MD section is shown in Figure 5-11. The corresponding output produced by the IDS Analyzer is shown in Figures 5-12 and 5-13. Each field of the user SDDL table dump is explained below with reference to the example extended MD section.

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Figure 5-12 Physical dump SDDL tables

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Figure 5-12 (cont'd)
Physical dump SDDL tables

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Figure 5-12 (cont'd)
Physical dump SOOL tables

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Figure 5-12 (cont'd)
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See	Figure 5-1 dump SDDL	3 tables				•

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Figure 5-13 (cont'd) User dump SDDL tables

IDS DATABASE

The name of the database for which the output below is collected. Each database defined within the combined extended MD section is printed. Note that this name is the same as that supplied on the run-time parameter file.

IDS NAME

User names supplied in the extended MD section. The user refers to these names in writing the TDL.

ADBMS NAME

Every user name has a corresponding six character ADBMS name. In some Translator error messages, the ADBMS name is output, hence, this listing is a useful cross-reference tool.

DISPL. (CHAR)

Displacement in characters of the group (if a containedin-repeating group) or item. Note in the example that ADMIN-NUM starts at location ten (10) since there are nine characters taken up by the IDS record header.

STORAGE CONSTRUCT

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For items, the storage representation is printed; for relations, the relation type is denoted. Possible relation types are:

CONCAT - concatenated relations

CHAIN - phantom pointers or IDS chains

MTCHKY - Match-key relations

Note that items that are PIC 99 are printed as alphanumeric-type.

PAD-CHAR

By default, alphanumeric items have a pad character of blank; computational items have a pad character of zero. This can be overridden by use of the "61 PAD" entry, however.

IDS/RIF LENGTH

The first number to the left of the slash(/) is the length in characters of the item in the IDS database. This should agree with the user's view of the database. The number to the right of the slash is the length in characters of the item as it is represented in the RIF. Note that all integers are single precision in the RIF and all floating point items are double precision in the RIF.

VALUE

For IDS records, this is the number specified by the TYPE IS clause. For ISP and sequential database records, the character string specified by the 61 IDENT entry is printed. Note that contained-in-repeating groups do not have a value. The Reader identifies contained-in-repeating groups by their displacement within their "containing" groups.

KEY

To the left of any item which was declared to be a primary key is the indication of *KEY*.

S-S-KEY

Any set-significant items defined in the EXTERNAL-KEYS-FROM level 61 will be denoted as a set-significant-key (S-S-KEY).

SET-SIG

All set-significant items for the group are identified by *SET-SIG* if they are not primary keys. In the example, because ADMINISTRATION is a detail of the relation P-A (whose master has three primary keys; LASTN, FIRSTN, INIT), three set-significant items must be present within ADMINISTRATION. Note that they are not physically present, only logically. Their names are constructed according to the rules given in Section 3.2.3 of the User Manual.

MASTER OF

Each relation of which the group is a master is listed along with the corresponding ADBMS name and relation type. Note in the example the construction of the concatenated relation name from ADMINISTRATION to STATE-DREF.

DETAIL OF

Each relation of which the group is a detail is listed along with the corresponding ADBMS name and relation type. Note in the example that since ADMINISTRATION is a CALC record, it must be a detail of a relation (whose owner is SYSTEM) named CALC-ADMINISTRATION.

After all the groups within each database have been printed, the last few pages of the report give a summary of all the relations (in alphabetical order) represented within the SDDL tables in question. Lastly, all system entry relations are listed for useful reference.

6.0 RUNNING THE TOL ANALYZER

After the user has created both the source and the target Stored Data Definition Language (SDDL) tables, it is necessary to supply the Translator with a description of the mapping (restructuring) to be performed by the Restructurer. This is done by supplying the Translation Definition Language (TDL) Analyzer with a textual description of the mapping. The TDL Analyzer then produces tables which are used by the Restructurer to perform the mapping. The general processing flow of the TDL Analyzer is as follows:

1. Make temporary copies of the source and target SDDL tables.

2. Analyze the TDL description and produce the TDL tables.

3. Post-process the tables by including information which improves the run-time performance of the Restructurer.

4. Optionally give a user-friendly dump of the TDL tables.

Before executing the TDL Analyzer, the following steps must be performed:

1. The IDS Analyzer must be run to produce source and target SDDL tables (see Section 5.0 for a description of this process).

2. A valid TDL description must be written (see Section 4.0 for a

description of this process).

3. A permanent file (random) must be created to hold the TDL table database. A rule of thumb to use for determining the size of this file is to use 18 llinks or one-half the size of the target SDDL database, whichever is greater. This formula will usually supply a TDL table size which is slightly larger than needed.

6.1 Detailed Overview of TDL Analyzer Execution

Executing the TDL Analyzer requires the five activities shown below:

1. Make temporary copies of the source and target SDDL tables.

2. Execute the TDL Analyzer to produce the TDL tables.

Post-process the TDL tables with the Sysacc builder.
 Post-process the TDL tables with the Compatibility builder.

5. Optionally give a user-friendly dump of the TDL tables.

The entire process is illustrated in Figure 6-1; the components are discussed below.

UTILITY

The GCOS utility program. See the UTILITY manual for a description of the output and error reports generated by this module.

SOURCE and TARGET SDDL TABLES ADBMS databases produced by the IDS Analyzer which contain the Data Translator's descriptions of the source and target databases.

SCRATCH COPY SOURCE and TARGET SDDL TABLES Temporary files which contain copies of the source and target SDDL tables.

UTILITY REPORT A report on the success or failure of the utility program.

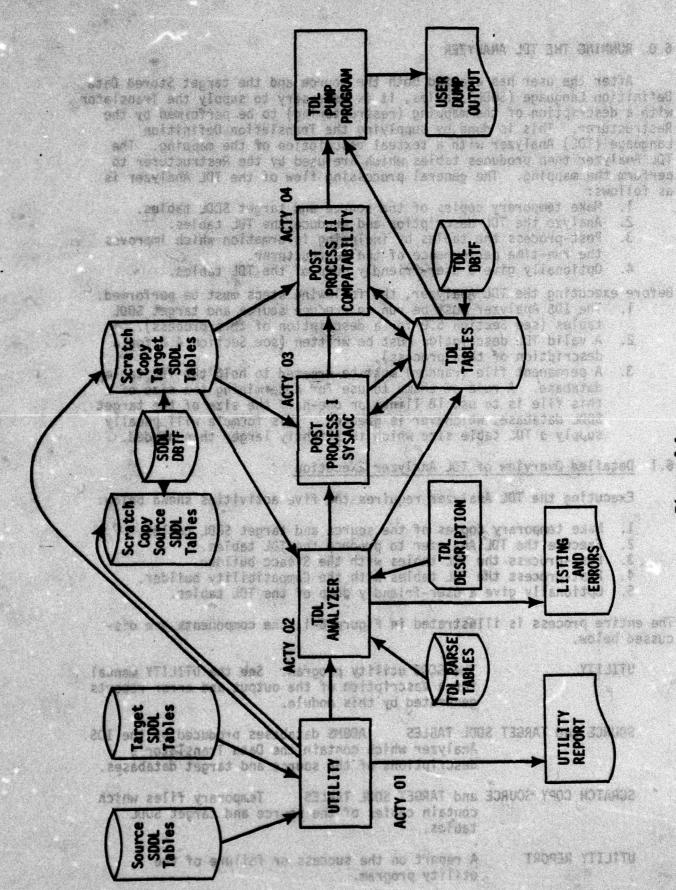


Figure 6-1 TDL Analyzer Components

TDL ANALYZER An R* file containing the object version of the TDL Analyzer.

TDL PARSE TABLES A file which contains the TDL parsing tables.

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The user-written TDL description. TDL description

SDDL DBTF The database tables file describing to ADBMS the format and contents of the SDDL tables databases. See Appendix F.

TDL Tables An ADBMS database containing the Data Translator representation of the restructuring mapping.

TOL DETF The database tables file describing to ADBMS the format and contents of the TDL tables database. See Appendix F.

LISTING AND ERRORS A listing (if requested) of the TDL description, user errors and warnings, and a statistical summary of the TDL Analyzer execution.

POST PROCESS I - SYSACC An R* file containing the object version of the first post-process.

POST PROCESS II - Compatibility An R* file containing the object version of the second post-process.

TDL Dump Program An R* file containing the object version of the program which produces the user dump of the TDL tables.

The user dump of the TDL tables. USER DUMP OUTPUT

PULT BEAR ATAN STILL DAYS SARE FILES 6.2 Explanation of Processing Flows

This section comprises a brief overview of the TDL Analyzer. Each activity is described in turn with a complete JCL description given in later sections.

The TDL Analyzer operates by sequentially reading each card image in the TDL description. Each card image is the checked-for syntax and semantic errors. If no errors are found, the SDDL tables are accessed and entries are made in the TDL tables (when appropriate).

6.3 TDL Analyzer JCL

Control cards for executing all five TDL Analyzer activities are illustrated in Figure 6-2. This sequence of control cards is available on the SYSGEN tape containing the Data Translator. Each activity is described below:

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described below:

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               IDENT
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               NOTE
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              NOTE
                           CORY SOURCE AND TARGET SOOL TABLES
1040
              NOTE
1050
              NOTE
                      *************
1060
              NOTE
1070
              UTIL ITY
1080
              FUTIL
                      14,15,RWD/.14/,RCOPY/1F/
                      14,R,R, SOURCE SDDL DATA BASE FILE
1090
              PRMFL
                      15.XIS.SIZE OF SOURCE SOOL DATA BASE FILE IN LINKS
1100
              FILE
1110
                      16,17,RWD/16/,RCOPY/1F/
              FUTIL
                      16.R.R.TARGET SDDL DATA BASE FILE
17.X2S.SIZE OF TARGET SDDL DATA BASE FILE IN LINKS
1120
              PRMFL
1130
             FILE
                      *************
1140
             NOTE
1150
              NOTE
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1160
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              NOTE
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              PRMFL
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                      H*,ZIR,4OR
1230
              PRMFL
                     04.R.S.TDL PARSE TABLES
1240
              BATA
                     02., COPY
                                               10th Depth Francisco
                     TOL DESCRIPTION
1250
              SELECTA
1260
             - ENDCOPY
1270
                     ANALYZER: OUTPUT IS ON FILE CODE 06
             NOTE
                     O7.XIR
1280
              FILE
                                               USER DURP ONTPUT
1290
              FILE
                     09.X2S
              PRMFL
                      11.W.R.TDL DATA BASE FILE
1300
                      12, R, S, ADBMS TABLE FILE FOR TOL TABLES
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1370
                            POST PROCESS I - SYSACC BUILDER
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1380
              NOTE
1390
                     *********
1400
              NOTE
1410
              EXECUTE NREST
              LIMITS .XX,33K,-3K,XX
                                     USE APPROPRIATE LIMITS
1420
              PRMFL R*,R,S,SYSACC BUILDER RSTAR FILE
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1440
                      07, W, R. TDL DATA BASE FILE
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filtestrated in Figure &=2. This sequence of control cards is available on the SYSSEN tage containing the Data Translaton. Each activity is

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                     08.X25
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                     TR.R.R.TRANSLATOR LIBRARY
             . PRMFL
1470
                     ********
            NOTE
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              NOTE
 1490
              NOTE
                        POST PROCESS II - COMPATIBILITY BUILDER
 1500
              NOTE
 1510
              NOTE
                     **********
 1520
              EXECUTE NREST
 1530
              LIMITS XX.52K,-3K,XX
                                   USE APPROPRIATE LIMITS
 1540
              PRMFL
                     R*,R,S,COMPATIBILITY RSTAR FILE
 1550
              PRMFL
                     07. W. R. TDL DATA BASE FILE
 1560
              FILE
                     08.X2S
 1570
              PRMFL.
                     TR.R.R.TRANSLATOR LIBRARY
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              NOTE
                     **********
 1590
              NOTE
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              NOTE
 1610 and
              NOTE
 1620
              NOTE
                     **************
 1630
      deferent off
                     19. ENDJOB SKIP DUMP IF NOT REQUESTED
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        $TAUHAR
              EXECUTE NREST
 1650
              LIMITS
                     XX,25K,-3K,XX USE APPROPRIATE LIMITS
 1660
                     R*,R,S,TDL DUMPER RSTAR FILE
              PRMFL
 1670
              PRMFL
                     02,R,R,TDL DATA BASE FILE
 1680
                     DUMP OUTPUT IS ON FILE CODE 06
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 1690
              PRMFL
                     TR.R.R.TRANSLATOR LIBRARY
 1700
              ENDJOB AN OSTI DAS DESI PROTE NO DELECTROL STORY COLOSI MAIS
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Figure 6-2 (cont.)

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6.4 TDL Analyzer - Activity 1

1020	\$.	NOTE	*****
1030	\$.	NOTE	
1040	\$.	NOTE	* COPY SOURCE AND TARGET SDDL TABLES *
1050	\$.	NOTE	# * * * * * * * * * * * * * * * * * * *
1060	\$	NOTE	***********
1070	\$	UTILITY	
1080	\$	FUTIL	14.15.RWD/14/,RCOPY/1F/
1090	\$	PRMFL	.14.R.R. SOURCE SDDL DATA BASE FILE
1100	\$	FILE	15.X1'S, SIZE OF SOURCE SOOL DATA BASE FILE-IN: LINKS
1110	\$	FUTIL	16, 17, RWD/16/, RCDPY/1F/
1120	\$	PRMFL	16.R.R.TARGET SDDL DATA BASE FILE
1130	中央	FILE	17.X2S, SIZE OF TARGET SDDL DATA BASE FILE IN LINKS

ABBRICA PROCESS II - COMPATIBILITY BUTGER

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	18				X1	S		TAG.			2.1	of source	e SDDL	tables	March Charle
	17				X2	es l	Ar E	4.570				of targe			

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Example of Output

Figure 6-3 is a sample of a successful execution of activity 1. The report is generated by the UTILITY program on report code 53. If the UTILITY operation is not successful, then a message indicating the problem will be printed. These messages are described in the UTILITY manual.

Discussion

and with the

Activity one makes temporary copies of the source and target SDDL tables. The user should enter the file names of the source and target SDDL tables where indicated on lines 1090 and 1120 respectively. The sizes of these files, rounded up to the closest link (12 llinks) should be entered where indicated on lines 1000 and 1130.

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Asignal strate. WE SOUR BILL NO FI LUMINO ASTAINANT 7719 PAGE 2278T 01 12/20/76 UTILITY REPORT 750204 FUTIL 14.15.RWD/14/.RCOPY/1F/ RCOPYD AND I FILE LINETI RCOPYD 1 FILE 1777,61 Mari 19 and notine motification the section of the section of section can HIS Total of Stan set v visná ent mort silt to Figure 6-3 Activity 1 Example Output 335 AMERICAN ASSOCIATION (18 MINUS) 96 A frequency was a Tank WT 400 JOSE JESTAL BEE TO MOTO ASTRONE ! M. CI The state of the s "He man became a fact that the state of the second court #35742 entraced learning living

6.5 TDL Analyzer - Activity 2

1140	\$	NOTE	*******
1150	\$	NOTE	
1160	S	NOTE	
1170	\$	NOTE	* EXECUTE TOL ANALYZER *
1180		NOTE	
1190	\$ \$		NO.07
	\$	EXECUTE	
1200		LIMITS	XX,46K,-3K,XX USE APPROPRIATE LIMITS
1210	\$ \$	PRMFL	R*,R,S.TDL RSTAR FILE
1220	\$	FILE	H*,ZIR,40R
1230	\$		04.R.S.TDL PARSE TABLES
1240	\$	DATA	O2., COPY
1250	\$ \$ \$		TDL DESCRIPTION
1260	\$	ENDCOPY	IDE DESCRIPTION
1270	\$	NOTE	ANALYZER OUTPUT IS ON FILE CODE 06
1280	Ś	FILE	O7.XIR
1290	\$	FILE	09. X25
1300	\$		
1310	ě	PRMFL	11.W.R.TDL DATA BASE FILE
1320	Š		12.R.S.ADBMS TABLE FILE FOR TOL TABLES
	高工作的运动 员员员员和国际人员员工的发生(4)(3)	FILE	13, NULL
1 330	\$	FILE	14, NULL
1340	\$	PRMFL	TR.R.R.TRANSLATOR LIBRARY
1350	\$	1F	18. IF TOL ERRORS THEN SKIP TO DUMP

F11code	LUD	<u>Description</u>
M.	ZIR	A required filecode so an entry can be made in PAT.
R**		IDL Analyzer R* file from the SYSGEN tape.
04		The TDL parsing tables from the SYSGEN tape.
02		The TDL description (in BCD).
06		TDL Analyzer output.
07	X1R	A scratch copy of the SOURCE SDDL tables.
09	X2S	A scratch copy of the target SDDL tables.
13, 14		Null files (for dump I/0).
TR		Random library of Data Translator object routines from the SYSGEN tape.

Example of Output

Figure 6-4 shows a sample of the TDL Analyzer output. TDL Analyzer error messages are printed on I/O unit O6. Due to the parsing algorithm, most error messages appear two lines below the actual error. Thus, the user should examine the two lines which precede an error message for the occurrence of the error. The error messages are discussed in Appendix B. Certain errors cause the TDL Analyzer to enter error recovery mode. When this occurs, the TDL Analyzer is attempting to continue processing by skipping any input lines that have been rendered invalid due to a previous error. The TDL Analyzer prints error messages indicating the points where the error recovery procedure was invoked and terminated. Any intervening input lines were not processed in any way.

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Discussion

Activity two executes the TDL Analyzer. The user should place appropriate file names in the JCL as indicated. The user should use limits appropriate for the given job in line 1200. Most TDL Analyzer executions require less than 0.1 hours of CPU time.

6.6 TDL Analyzer - Activity 3

1360	s NOTE	**********
1370	s NOTE	
1380	s NOTE	* POST PROCESS I - SYSACC BUILDER *
1390	s NOTE	* FUSI PRUCESS 1 - SYSACC BUILDER *
1400	s NOTE	**********************
1410	\$ EXECUTE	NREST
1420	S LIMITS	XX.33K3K.XX USE APPROPRIATE LIMITS
1430	S PRMFL	R*.R.S.SYSACC BUILDER RSTAR FILE
1440	S PRMFL	O7.W.R.TDL DATA BASE FILE
1450	\$ FILE	08.X2S
1.460	S PRMFL	TR.R.R.TRANSLATOR LIBRARY

<u>Filecode</u>	<u>LUD</u>	Description
R*	Post	-process J R* from SYSGEN tape.
07		tables.
08		tch copy of target SDDL tables.
TR	Tran	slator library from SYSGEN tape.

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DEC 20. 1976
                                                                 PAGE
UNIVERSITY OF VICHIGAN ANALYZER (VER. 2-2) 11.41.08
DATA BASE INITIALIZED WITH 7 PAGES.
     >/* NEW PREZ TO PREZ PARTS STATES */
>/* SD */
     >TARGET RECORD CITIES
> TOLAP CITI
     >/* SD */
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          SOURCE RECORD CITIES ACCESS VIA HAS-LARGE-CITIES
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          SET SIGNIFICANT DATA BY NAME
T DECORD OCCUPANDE
     >TARGET RECORD OCCUP-MARR
   10 >
              SOURCE RECORD PRESIDENT ACCESS VIA CALC-PRESIDENT
   11
                 FIRST-NAME ASSIGN TO PRES-S-FNAME<PRES-INFO>
   12
                 INIT ASSIGN TO PRES-S-MNAME<PRES-INFO>
   13
             LAST-NAME ASSIGN TO PRES-S-LNAME PRES-INFO>
       SOURCE RECORD OCCUPATION ACCESS VIA HAD-OCCUPATION
         enolymosta natyleni
                        TITLE-OF-JOB ASSIGN TO TITLE-OF-JOB
                     SOURCE RECORD MARRIAGE-DATA ACCESS VIA
   10
   17
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                        MONTH-MARRIED ASSIGN TO MONTH-MAPRIED
   20
                         DAY-MARRIED ASSIGN TO DAY-MARRIED
                         YEAR-MAPRIED ASSIGN TO YEAR-MAPRIED
   22
                        NUMBER-OF-CHILDREN ASSIGN TO NUMBER-OF-CHILDREN
   23 >
   24 >TARGET RECORD PRESIDENT-S
          TIDLAR PRES
   25
              SOURCE RECORD PRESIDENT ACCESS VIA CALC-PRESIDENT
   26
                     SET SIGNIFICANT DATA BY NAME
   27
                  FIRST-NAME ASSIGN TO PRES-S-FNAME
   28
                INIT ASSIGN TO PRES-S-MNAME
                                                                 03.44
   29
                  LAST-NAME ASSIGN TO PRES-S-LNAME
   30
     >TARGET RECORD STATES-S
          TULAR STAT
   32 >
              SOURCE RECORD STATES-IN-UNION ACCESS VIA CALC-STATES-IN-UNION
   33 >
                  STATE-NAME ASSIGN TO STATE-NAME
   34 >
                  YEAR-ADMITTED ASSIGN TO YEAR-ADMITTED
   35
                  CAPITAL ASSIGN TO CAPITAL
   36 >
                  AREA-SO-MI ASSIGN TO AREA-SO-MI
   37
                  AREA-RANK ASSIGN TO AREA-RANK
                 POPULATION ASSIGN TO POPULATION
   39 >
                 POP-PANK ASSIGN TO POP-PANK
   40 >
                  ELECTORAL-VOTES ASSIGN TO ELECTORAL-VOTES
              SOURCE RECORD STATES-ADMITTED ACCESS VIA ADMITTED-DURING
      Senter Sent ACCEPT IF NULL
   43
                     SOURCE RECORD ADMINISTRATION ACCESS VIA
   45 SANT MINEYE MOTT YTOTAL TO ADMITTED-STATES
                         ACCEPT IF NULL
   46 >
                      ADMINISTRATION-NUMBER ASSIGN TO
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Figure 6-4 Activity 2 Example Output

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 UNIVERSITY OF MICHIGAN ANALYZER(VER. 2-2) 11.42.36
                                                                                                                                                                                          DEC 20. 1976
                     ***********************************
ANALYZER STATISTICS

LAITIALIZATION TIME = 0.65 SECONDS

PROCESSING TIME = 11.43 SECONDS

DUMPING TIME = 0.04 SECONDS

TOTAL TIME = 12.11 SECONDS
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         50 CARDS WERE PROCESSED
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                                Most erecutions of this activity require less than 0.1 hours of CPU state.
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Example of Output

Figure 6-5 shows the output generated by this activity.

Discussion

The user should supply appropriate file names and limits as indicated. Most executions of this activity require less than 0.1 hours of CPU time.

6.7 TDL Analyzer - Activity 4

1470	NOTE	******
1480	\$ NOTE	
1490	\$ NOTE	* POST PROCESS II - COMPATIBILITY BUILDER *
1500	\$ NOTE	
1510	\$ NOTE	************
1520	\$ EXECUTE	NREST
1530	\$ LIMITS	XX,52K,-3K,XX USE APPROPRIATE LIMITS
1540	\$ PRMFL	R*,R,S,COMPATIBILITY RSTAR FILE
1550	\$ PRMFL	O7, W. R. TDL DATA BASE FILE
1560	\$ FILE	08,X2S
1570	\$ PRMFL	TR.R.R.TRANSLATOR LIBRARY

Filecode	LUD	<u>Description</u>						
R*		Post-process II R* from SYSGEN tape.						
07		TDL table.						
80	X2S	Scratch copy of target SDDL tables.						
TR		Translator library from SYSGEN tape.						

Example of Output

Figure 6-6 shows the output generated by this activity.

Discussion

The user should supply appropriate file names and limits as indicated. Most executions of this activity require less than 0.1 hours of CPU time.

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Figure 6-5	1.8.8.10	AVAG. F &
Activity 3 Example Outp	ut a. A. a	TWON
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Activity 4 Example Out		The user shoul cated. Most ex PU time.

6.8 TDL Analyzer - Activity 5

1580 1590	\$: \$	NOTE	******
1600	\$. \$.	NOTE .	* TDL TABLE DUMPER *
1620	\$.	NOTE	19, ENDJOB SKIP DUMP JF NOT REQUESTED
1640		- EXECUTE - LIMITS	NREST XX,25K,-3K,XX USE APPROPRIATE LIMITS
1670	\$	PRMFL :	R*, R.S. TDL DUMPER RSTAR FILE 02, R.R. TDL DATA BASE FILE
1680	\$	NOTE PRMFL .	DUMP OUTPUT IS ON FILE CODE 06 TR.R.TRANSLATOR LIBRARY.

Filecode LUD	<u>Description</u>
R*	R* file for TDL table. Dumper from SYSGEN tape.
02	TDL tables.
06	TDL dump output.
TR	Translator library from SYSGEN tape.

Example of Output

Figure 6-5 shows an example of part of the TDL dump output. The TDL user dump output provides the user with a description of the TDL tables that were produced. The dump is arranged by target records. It includes many items of information with which the inexperienced or casual user should not be concerned. The TDL user dump is primarily provided for those users whose restructuring needs call for unorthodox or complicated TDL descriptions. The casual user may, however, find it a useful device for verifying that the TDL description is correct.

Discussion

The user should supply the appropriate file names and limits as indicated. Most executions of this activity require less than 0.1 hours of CPU time.

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COMPATIBLE OCCU	SOURCE ITEM - KEY CONVERSION FIRST _ 000002001340 000000	STATE- 000002001204. ACCEPTIE STATE- 000002001274 00	TARGEL RECORD OCCUP-, SYSSEI SY811=, ACCESS. ACCESS PAIN OCCU	SOURCE_RECORD PRESID MAS_KEY=000002000300. MIIH_KEY=000002000242. REJECT_IE_NULL.	SQUECE_ITEH - KEY CO FIRST- 000002000334 OC INIT 000002000440 OC LAST-N 000002000444 OC	SOURCE_RECORD OCCUPA MAS_KEY=000002000510 WIIH_KEY=000002000300. REJECT_IE_MULL.	SQUECE_IIEH - KEY CI TITLE- 000002000544 00	SOURCE_RECORD MARRIT MAS_KEY=000002000610. WIIH_KEY=000002000300. REJECI_IE_NULL.	SOURCE_ITEM - KEX CI DAY-HA 000002000754 0 HONTH- 000002000710 0 NUMBER 000002001064 0 WIVES- 000002001020 0

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SOURCE_BECORD STATES MAS_KEY=000002001570. ACC	MITH_KEY=000002001532. REJECT_IE_MULL.
SOURCE_RECORD STATES HAS_KEX=000002001570. ACC	MITH_KEX=000002001532. REJECT_IE_NULL.
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0 3 ADMITT
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7.0 THE READER MODULE

The fourth step in the Data Translation process is running the Reader. The Reader is the first module to work with the user's data. It converts the user's WWDMS sequential, ISP or IDS database to one ADBMS database called the source RIF. The source RIF (SRIF) is logically equivalent to the source database(s). The Reader is driven by information stored in the source SDDL tables. Before the Reader can be run the following steps must be completed:

1. The source SDDL tables must be successfully created.

2. The source database(s) should be available. MD sections for all IDS databases should be available.

3. All necessary files (see Section 7.4) should be created.

7.1 Reader Submodules

The Version IIA Release 2 Data Translator has three Reader modules: one each for WWDMS sequential, ISP and IDS databases. Each Reader performs the same function, that is, produces the source RIF, but due to the differences of each of the file systems the Readers consist of different submodules to improve operating efficiency. The architecture of each Reader is shown in Figure 7-1, 7-2, and 7-3. Figure 7-4 shows the Reader configuration for one IDS, one ISP and two WWDMS sequential databases. Although Figure 7-4 is probably not a typical example, it shows the use of all three Readers to create one SRIF.

The Reader submodules of which the user should be aware and should

understand are the following:

1. Accessor (IDS, ISP, sequential) - the Accessor retrieves logical records from the database. The IDS Accessor is a COBOL-IDS program which only reads pages and returns information describing each logical record. Note that the IDS Accessor must be compiled with the MD section for the database before the IDS Reader can be run.

. Populator (Network, Hierarchical) - the Populator controls the linking of sets in the SRIF. It duplicates the logical relationships that exist in the source database(s) in the SRIF. The network Populator uses an internal database called the Deferred Reference Table (DRT). The DRT contains infor-

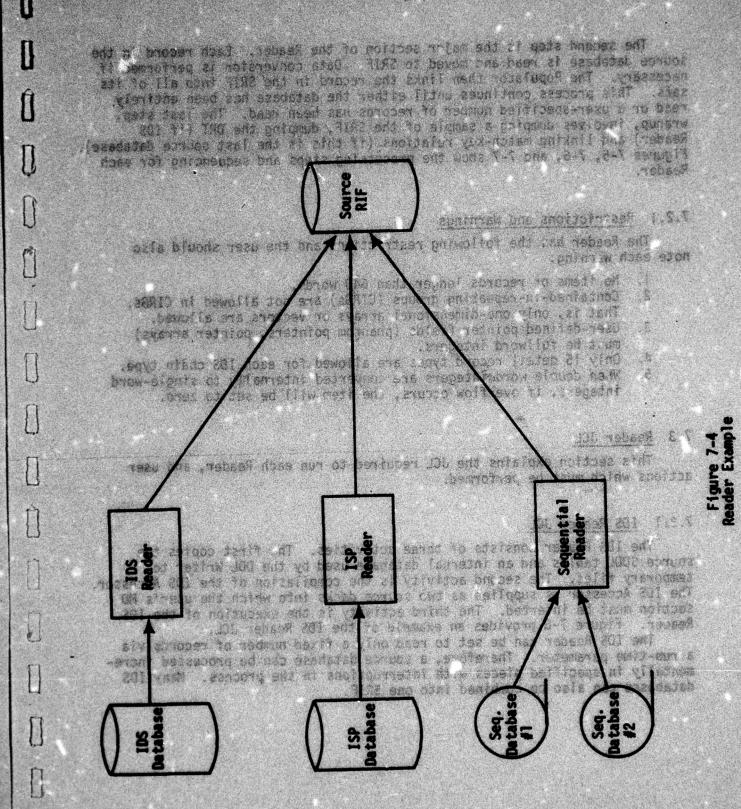
mation about sets in the SRIF.

 Reader Control - the Reader Control submodule is essentially the same for each Reader. It performs initialization and wrapup steps, moves data to the SRIF, links SYSTEM-owned sets, and links match-key relations.

7.2 Reader Processing Flow

Each Reader uses the same type of algorithm, only capabilities differ. The first step of the Reader algorithm is initialization. During initialization the DDL Writer module is executed. It writes the ADBMS DDL for the SRIF using information in the source SDDL tables. Then, if this is the first Reader run, the SRIF is initialized and (if IDS Reader) the DRT database is initialized.

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The second step is the major section of the Reader. Each record in the source database is read and moved to SRIF. Data conversion is performed if necessary. The Populator then links the record in the SRIF into all of its sets. This process continues until either the database has been entirely read or a user-specified number of records has been read. The last step, wrapup, involves dumping a sample of the SRIF, dumping the DRT (if IDS Reader) and linking match-key relations (if this is the last source database). Figures 7-5, 7-6, and 7-7 show the processing steps and sequencing for each Reader.

7.2.1 Restrictions and Warnings

The Reader has the following restrictions and the user should also note each warning:

1. No Items or records longer than 640 words.

Contained-in-repeating groups (CIREs) are not allowed in CIRES.
 That is, only one-dimensional arrays or vectors are allowed.

3. User-defined pointer fields (phantom pointers, pointer arrays)

must be fullword integers.

Only 15 detail record types are allowed for each IDS chain type.
 When double word integers are converted internally to single-word integers, if overflow occurs, the item will be set to zero.

7.3 Reader JCL

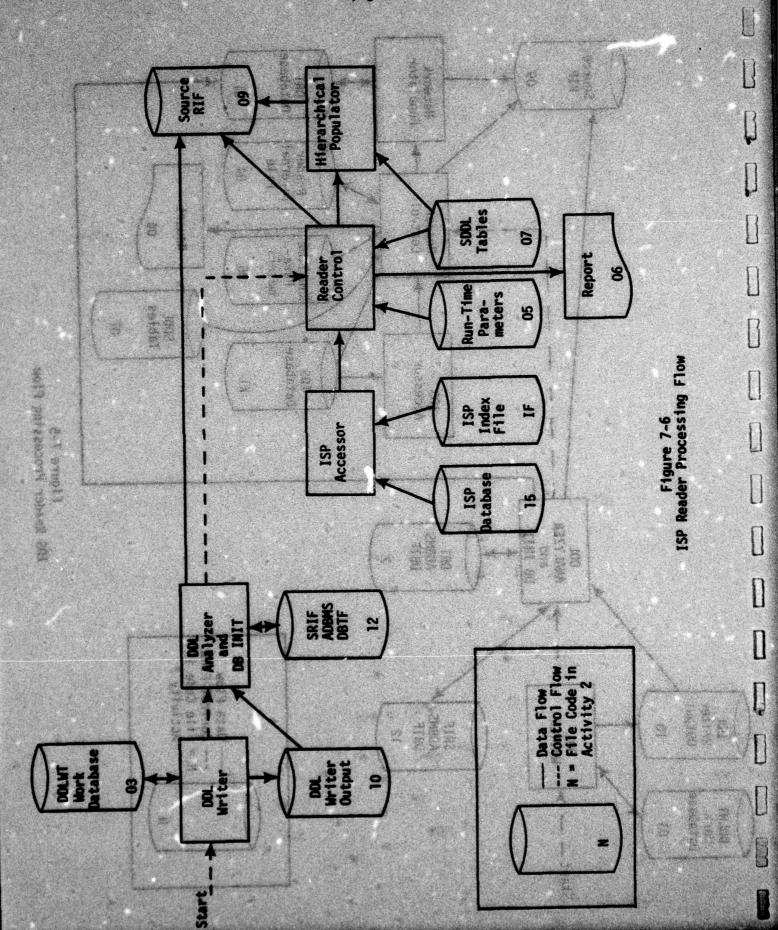
This section explains the JCL required to run each Reader, and user actions which must be performed.

7.3.1 IDS Reader JCL

The IDS Reader consists of three activities. The first copies the source SDDL tables and an internal database used by the DDL Writer to temporary files. The second activity is the compilation of the IDS Accessor. The IDS Accessor is supplied as two source decks into which the user's MD section must be inserted. The third activity is the execution of the IDS Reader. Figure 7-8 provides an example of the IDS Reader JCL.

The IDS Reader can be set to read only a fixed number of records via a run-time parameter. Therefore, a source database can be processed incrementally in specified pieces with interruptions in the process. Many IDS

databases can also be combined into one SRIF.



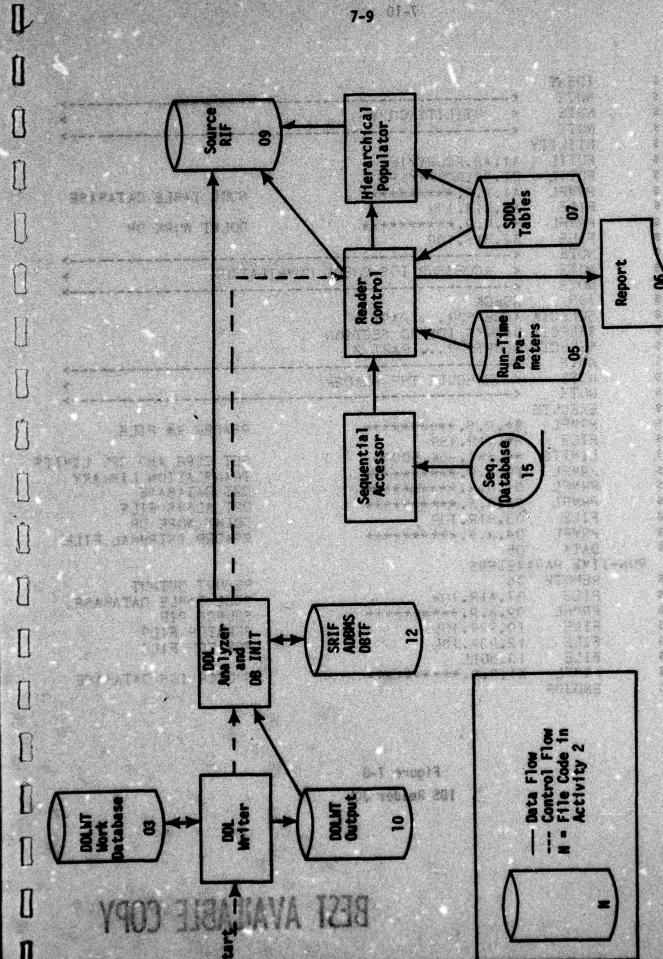


Figure 7-7 Reader, Processing Flow

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70	\$		B1.B2.RCOPY/IF/	SOOL TABLE DATABASE
90	\$		A1.R.R.*********************************	TABLE IN THE DATA MOL
100	Superior sup	PONE	B1.R.R.******	DOLWT WORK DR
110	S		B2.815.109	
120	\$	NOTE	C	
130	\$	NOTE	< ACCESSOR IDS-COBOL COM	PILATION
	s .	NOTE		
	s 🚡	IDS	NDECK ACCESSOR PART 1	The state of the state of
	Š	SELECTA	USER'S IDS NO SECTION .	
180	S	SELECTA	ACCESSOR PART 2	
	\$	NOTE	K	
200	\$		- EXECUTE THE READER	* +
210	S	NOTE		
220	s s	EXECUTE	R*. P. S. *******	READER R* FILE
230	5	FINE	H*.YIR.15R	
	S	LIMITS	**, **K5K.50000	SET CORE AND CPU LIMITS
	S	PRMEL	TR.R.R. ********	TRANSLATION LIRKARY
210 6	\$.	PRMFL	01, W, R, ******	DRT DATARASE
280	S	PRMFL	02.W. S. *** ******	DRT ADRMS FILE DDLWT WORK DR
290	\$ 5		03.BIR.10R	READER INTERNAL FILE
300	\$	PRMFL DATA	05	Tonoca IIII canal a canal
310 320		TIME PAR		
330	s	REMOTE		REPORT OUTPUT
340	\$	FILE	07.A1R.10R	SDDL TABLE DATABASE
350	\$	PRMFL	09.W.R. *******	SOURCE PIF
360	\$	FILE	10.R2R.10L	SCRATCH FILE
370	5	FILE	12.R3R.10L	1 Pontium 1122
380 390	\$,	PRMEL	X1.R.R. ********	SOURCE IDS DATARASE
400	\$	ENDJOR		
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		and the		
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Figure 7-8
IDS Reader JC

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D 60 €		PRMFL	Al.R.R. ********	SDDL TABLE DATABASE
90	. \$	FILE	A2. A15. 10R	
100	S	PRMFL	RI.R.R. ********	DDLWT WORK DR
0 110	\$	FILE	B2.815.10R	
120-	· · · · · · · · · · · · · · · · · · ·	NOTE	< xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx	·>
130	\$	NOTE	< EXECUTE THE READER	>
_ 140		NOTE	<	
150	S	EXECUTE		
1 160	\$	PRMFL		PEADER R* FILE
170	\$	FILE	H*.YIR.15R	CET BOOK AND AND THITE
1180	S	LIMITS		SET CORE AND CP! LIMITS
∐ 190	\$	PRMFL	TR.P.R.*********	TRANSLATION LIBRARY DDLWT WORK DR
200	S S	FILE	UJ. DIA FUA	DUCHT HURY OF
1 220		DATA N-TIME PAR	O5	PARA BAYY-QUP
LJ 230	STA	REMOTE		PEPORT OUTPUT
240	<u></u>	FILE		
1 250	Š		09.W.R. ********	
U 260	5 1		10.R2R.10L	
270	s		12.R3R.10L	
11 280		FILE	13-NULL	
LJ 290	APATSO	PRMFL	15.R.R. ********	SOURCE ISP. DATA BASE
300	\$	PRMFL	IF.R.R.******	ISP INDEX FILE
TI 310	\$	DATA	DC	ISP DATA CARDS
320	ISP	INDEX	FC=IF	
330	152	DATA	FC=15	
17 340	ISP	RECORD	*****	SET RECORD PARAMETERS
350	. 5	ENDJOR		
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п		the DM Wri	Figure 7-9	
11 282	sufference of Till 19	where is the	week and appropriate building the contract	

The ISP Reader consists of two activities. The first activity copies the SOOL tables and an internal database used by the DOL Writer to temporary files. The second activity is the execution of the ISP Reader. Figure 7-9 indicates the JCL required to run the ISP Reader.

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7.3.2 150 Reader ICL

7.3.3 WNDMS Sequential Reader JCL

10	s IDEN	Γ	
20	s NOTE		
30	\$ NOTE		
40	- NOTE	<	>
50	s UTIL		
60	\$ FUTI		
70	\$ FUTI		
80	S PRMF		SDDL TABLE DATABASE
90	\$ FILE		
100	S PRMF	B1.R.R.*******	DDLWT WORK DR
110	\$ FILE	B2-B1S.10R	
120	s NOTE	· · · · · · · · · · · · · · · · · · ·	
130	\$ NOTE	< EXECUTE THE READER	
140	s NOTE	<	
150	\$ EXEC	JTE	
160	\$ PRMF	L R*.R.S.*******	- READER R* FILE
170	s FILE	H*.YIR.15R	
180	S LIMIT	rs **.**K5K.50000	SET CORE AND CPU LIMITS
190	S PRMF	TR.R.R.*******	TRANSLATION LIPPARY
200	\$ FILE		
210	\$ DATA	05	
220	RUN-TIME I	PARAMETERS	
230	s REMOT	TE 06	REPORT OUTPUT
240	s FILE	07.AIR.IOR	SDDL TABLE DATABASE
250	S PRMFI	. 09.W.R.******	SOURCE RIF
260	s FILE		SCRATCH FILE
270	s FILE		SCRATCH FILE
280	\$ FILE		COUNTED TILE
290	S PRMEI		SOUDCE SED DATABASE
300			MUNCE SEN. DATE SASE
300	\$ ENDJ(SOURCE SEQ. DATABAS

Figure 7-10 Sequential Reader JCL

The Sequential Reader consists of two activities. The first activity copies the SDDL tables and an internal database used by the DDL Writer to temporary files. The second activity executes the Sequential Reader. Figure 7-10 indicates the JCL for the Sequential Reader.

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An explanation of the files and output for the IDS Reader is given in Section 7.5. Sections 7.6 and 7.7 explain the files and output for the ISP and sequential Readers.

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7.5 IDS Reader Files and Reports

1.7	3	INDIVI		A920.3977773.306
20 30	\$ \$	TON ETON	< UTILITY COPY	3.000-198-22-796-004
40	\$	NOTE	<	
50	S	UTILITY		All the second of the second
ာပ္ေ	S	- FUTIL	A1.A2.RCOPY/IF/	
70	\$	FUTIL	BI.B2.PCOPY/IF/	
c0	0.48214	DDALI.	A1.P.R.*******	SDDL TARLE DATARASE
90	\$	FILE	A2.415.10R	DIST AIT LODGE ISD

90 \$ FILE 100 S PRMFL B1.d.P.******* DDL WT WORK DP 110 FILE 82.815.10P S volument E.S.T

Figure 7-11 Activity 1

7.5.1 Activity 1

The first activity of the IDS Reader copies the source SDDL tables and an internal database used by the DDL Writer to temporary files. Line 80 (in Figure 7-11) should refer to the file containing the source SDDL tables. Line 100 should refer to the DDL writer's work database that was brought off the system generation tape (see Appendix G). The user should check report code 53 to be sure the first activity terminated normally.

7.5.2 Activity 2

120	S	NOTE	{
130	s	NOTE	< ACCESSOP IDS-CUROL COMPILATION >
140	S	NOTE	<>
150	\$	IDS	NDECK
150	\$	SELECTA	ACCESSOR PART 1
170	- S	SELECTA	USER'S IDS NO SECTION
130	\$	SELECTA	ACCERSOP PART 2

Figure 7-12 Activity 2

The second activity compiles the IDS Accessor. The two sections of Accessor source code should be brought off the system generation tape (see Appendix G) and saved in permanent files. Lines 160 and 180 (in Figure 7-12) should refer to those files. The MD section for the database to be read should be inserted in line 170. The MD section should begin with MD FILE IS...not IDS-SECTION. The following words should not be included in the user's MD section: the user's MD section:

ACC-C-ADDR ACC-ERROR-VALUE ACC-CHECK-FOR-PAGE-HEADER ACC-DEFINE-SYMBOLS ACC-DELETE-SWITCH Green 190 man apropose d ACC-END-DB ACC-EOF

ACC-FIRST-TIME ACC-IERROR ACC-LEN ACC-OPEN-DB ACC-REC-TYP

ACC-REF-COD ACC-RETRIEVE-RECORD ACC-RETURN-PARA ACC-SET-UP-REF-CODES

ACC-TOTAL-REC ACC-TOTAL-RECORDS ACC-TOTAL-STRING ACC-TR ACC-W-ADDR

The MD section, not the Accessor code, should be changed if any of the above words appear in the user's MD section. Report code 74 should be checked for IDS or COBOL compilation errors. Errors due to name conflict should be corrected and the Reader can be run.

7.5.3 Activity 3

190	s	he/15%		
	A CALL PROPERTY OF THE PROPERTY OF	NOTE:	TVENUE TO DEVICE	
2/00	\$	MOTE	< EXECUTE THE PEADER	
210	\$	FTON	. <	>
220	\$	EXECUT		Tarbust's 123
230	S	PRALL	2*.R.S.******	PENDER P* FILE
240	9:50	FILE	64*.Y19.459	Invition dentities.
250	\$	MITS		SET CODE AND CPU LIVITS
250	Samuel	SEPPIFIL	TH. R. *******	TRANSLATION LIBRARY
210	1 S 12	PRMEL	01.0.R.*******	DOT DATARASE
250	\$ 000	PRMEL	02.4.5.*******	DRT ADPMS FILE
290	S		03.419.108 77 77 207 200 10 11	DOLWT WORK OR
300	S	PRMHL.	04.n.S.*******	PEADER INTERNAL FILE
310	\$	DATA	05	
320	~ -₹5	N-TIME PAR	RAMETERS	September 1981
330	\$	REMOTE	06	PEPORT OUTPUT
340	\$	FILE	07.41P.103	SOUL TABLE DATARASE
350	\$	PRMAL	79.4.2.******	SOUNCE DIE
350	\$	FILE	10.828.101	SCRATCH FILE
370	S	FILE	12.83R.10L	SCRATCH FILE
3 50	S	FILE	13.NULL	
330	S	PRWEL	X1.P.R. *******	SOURCE IDS DATABASE
4)()	· S	END JOR	* ** ** * * * * * * * * * * * * * * *	

Figure 7-13 Activity 3

The following lines should be set in Figure 7-13 as follows: test sous moits reason and

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230 This should be the IDS Reader R* file to be used. It should be saved in a permanent file created from the system generation tape (Appendix G).

250

The core limit should be set to the size given for the IDS Reader in Appendix G. The CPU limit should be set so that the Reader can finish in the allotted time. Assume that the Reader can process approximately 6000 IDS records per CPU hour.

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260 The Translation Library is a library of low-level to filecodes X2. routines essential to the Reader. It can be found on the system generation tape (Appendix G). 270 The user should create a random file which is about twenty-five percent the size of the source nt limes at the resulting IDS database to be used as the DRT database. That erupia ni mwanc zi jugion file should be referenced here. vent se between one anet 280 The DRT ADBMS DBTF should be copied off the system someten entreallers of generation tape to a permanent file (1 11ink. sypping to the UNI database. sequential). 300 The IDS Reader's Internal file should be copied off it the norter of latically in the exerce. the system generation tape to a permanent file (1 llink, sequential). receiped will be entitled The run-time parameters should be set here. There are five run-time parameters: 1. The word "FIRST" should be included on this line if and only if this is the first time the Reader has accessed the source database. 2. The word "LAST" should be included on this are all all asserted and to my line if and only if this is the last run on the source database. Note that if there is only one run of the Reader "FIRST" and "LAST" both should be used. 3. The word "DEBUG" should be included on this line if and only if a list of IDS reference codes and corresponding ADBMS keys is desired. For each set instance in each record instance, the IDS reference codes and set type will be the of motion with the printed. Note that this could potentially proest if (the trought and) duce an extremely large amount of output. 4. The name of the database must be included on blues residence ent this line in the form: NAME=database-name Proder Gate Teachers where database-name is the name of the database were the said data medical and its first character immediately follows the u Tr . . ofe TYPEAR TXXX equals sign. 5. The number of records to be retrieved from the IDS database should be included here in the know and would "Toughad to him bring age of the property of form: neight and the start are RECORDS-n or RECORDS=ALL momentum 202 days of TD-202 extension where the first n records will be retrieved or ALL records are to be retrieved. Note that the IOS Reader can read a database of 100,000 records by running the Reader ten times with RECORDS . (00001 to take or other characters) The source RIF should be a random, permanent file.

It should be about twice the size of all source databases.

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The source IDS database should have filecode X1. Subfiles should have filecodes X2, X3, etc.

7.5.4 IDS Reader Output and DRT Dump

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All Reader output which is of any value to the user can be found in report code 06. An example of the first page of output is shown in Figure 7-14. After the page header, the run-time parameters are printed as they appeared in the run-time parameter file. The next four lines are initialization messages from the ADBMS system. The first initialization message corresponds to the SRIF and the second line corresponds to the DRT database. (Note that a page is 1024 words). If there were no errors during the Reader execution, the number of IDS records retrieved and the number of logically deleted IDS records which were physically deleted in the SRIF will be printed. If there were errors in the Reader execution, error messages will be written after the database initialization message.

Beginning on the second page of output will be the final dump of the DRT database. The DRT dump contains information concerning every chain-type relation in the source IDS database(s). For each set in the SRIF there will be a line of output with the name of the set (RELATION), the set type (TYPE), the master and detail records (PARENT, DEPENDENT), the sibling set type (SIBLING), and the displacement and length of the pointer fields in the master and detail (OWNDIS, OWNLEN, MEMDIS, MEMLEN). The set type (TYPE) can be either an IDS chain (IDSCHN) or a user's phantom pointer (PHNCHN). The sibling set type (SIBLING) can be disregarded by the user. The length and displacement of the pointer fields should be checked for correctness.

Since the DRT dump can take on many different forms the following general tips should help the user determine whether the Reader ran correctly. These tips apply only when the Reader is run for the LAST time. For all other runs, the DRT dump can be ignored.

1. For IDSCHN-type relations, only the line of output with the relation name, etc., should appear. (See Figure 7-15). If the relation header line is followed by a line with FIRST, NEXT, PARENT, etc., some sort of error has occurred. The problem could be in the source database(s) or the Reader. Data Translation personnel should be contacted to pinpoint the error.

For PHNCHN-type relations, the line of output with the relation name, etc., should be followed by FIRST, NEXT, PARENT, etc., if there were any instances of that relation in the source database. ed) son' i Figure 7-16 shows an example of this type of output. Under the word PARTYP, REAL should be the only word which appears. If the word SURG is present, an error has occurred and Data Translation personnel should be contacted. Under IDSKEY is the IDS reference code of the owner of the set instance and under NUMMEM is the number of members of the set instance. A few of the set instances and don't the should be checked in the source database to be sure they are correct. ab iopen bi

If any IDS reference code field (FIRST, NEXT, IDSKEY) is not a valid IDS reference code (maybe it is blanks or other characters), the user should check the OWNDIS, OWNLEN, MEMDIS and MEMLEN for the correct values. If an incorrect value appears, the IDS MD section should be corrected, the SDDL tables should be recreated and the Reader should be rerun.

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00000000000	00000000000	000011000241		00000001703	1	
00000000000	00000000000	000002000633		000000001704	1	
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00000000000	00000000000	000011000465		000000002002	ī	
00000000000	00000000000	000011000631		000000002003	i	
00000000000	00000000000	000011000673		000000002101	ō	
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	00000000000	000011001416		000000002602		
	00000000000	000011001534		000000002603	7	Figure 7-16
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	00000000000	000012000476		000000003101	ŏ	
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	00000000000			000000003504	0	
	000000000000			000000003601		
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DATA ITEMS FOR THI YEAR-A *1789* CAPITA *RALEIGH * AREA-S * 57712* AREA-R *24* POPULA * 5135000* POP-RA *11* ELECTO *13*	THIS RECORD ARE	Figure 7-17 SRIF Dump		

```
IDS REF=000000000101 PRESID
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  PRESID
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                  000000000101 000000001301
  PRESID
          P-E
                  000000000101 000000005312
          P-PCL
  PRESID
                  000000000101 000000003203
  PECSID
          S-P
                   IDS REF=000000000102 PRESID
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                  000000000102 000000003714
                                                    0
                  000000000102 000000001003
                  000000000102 000000005345
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                   IDS REF=000000000103 PRESID
KEY=000002000501
                  000000000103 000000004102
  PRESID
          P-A
                                                    0
                  000000000103 000000000103
          P-E
  PRESID
                  000000000103 000000005372
                                                     0
          P-PCL
  PRESID
                  000000000103:000000001703
           S-P
  PRESID
                   IDS REF=000000000104 PRESID
KEY=000002000675
                  00000000104 000000004204
           P-A
  PRESID
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                  000000000104 000000001010
  PRESID
           P-E
                  000000000104 000000005426
                                                     0
           P-PCL
  PRESID
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           P-PCL
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                  000000000106 000000001604
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           S-P
  PRESID
                    IDS REF=000000000201 PRESID
KEY=000002001423
                   000000000201 000000003707
  PRESID
           P-A
                   000000000201 000000001001
   PRESID
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           P-PCL
   PRESID
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           S-P
                    IDS REF=000000000202 PRESID
 KEY=000002001631
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                   000000000203 0000000000603
```

7.5.5 Source RIF Dump

After the DRT dump, a small portion of the SRIF is dumped. For each SYSTEM-owned set in the SRIF, the first and last member of the set is dumped. An example of this output is shown in Figure 7-17. After the page header, the name of the set and the number of members are printed. The name of the member record and the ADBMS key for that record instance are then printed. The user can generally ignore the list of set pointers for the record. The list of data items should be closely checked for errors such as missing data and data with unreasonable values. For each data item, the name of the field is written and then its value is printed. Character data items are delimited by asterisks whereas integer and floating point data are not delimited. If an error is found in any item, the user should determine whether the problem is in the IDS database or the Reader, and then correct it. Note that some records may be dumped twice if they are members of CALC sets.

7.5.6 Debug Output

When the user specifies DEBUG as a run-time parameter, additional output will be written on report code 06. The DRT will be dumped after it has been initialized, and for each record instance in the source database(s), the following output will be printed:

1. The IDS reference code of the record (IDS REF=).

2. The ADBMS key of the logically equivalent record in the SRIF (KEY=).

3. For each set instance in the record, a line will be printed with the name of the record, the name of the set, the IDS reference code of the current record, the IDS reference code of the NEXT record in this set instance, a flag (= 2 if member in the set, =1 if owner of the set) and the deletion flag (=1 if logically deleted).

An example of the debug output is shown in Figure 7-18. The user should note that the DEBUG feature can produce a considerable amount of output for a large database.

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7.6 ISP Reader Files and Reports

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Figure 7-19
Activity 1

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7.6.1 Activity 1

The first activity of the ISP Reader copies the source SDDL tables and an internal database used by the DDL Writer to temporary files. Line 80 (in Figure 7-19) should refer to the file containing the source SDDL tables. Line 100 should refer to the DDL Writer's work database that was brought off the system generation tape (see Appendix G). The user should check report code 53 to be sure the first activity terminated normally.

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7.6.2. Activity 2 at outer all hard bee next to a seed on the

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150	S PRMFL	R*.2.5.*******	PEADER P* FILE
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230	S REMOTE		REPORT OUTPUT
240		A	SDDL TABLE DATARASE
250	s POMEI	70.4. P. *+*****	SOURCE RIF
250		10 .20 101	CODITOR STIE
270	File	12.83R.10L	SCRATCH FILE
280	s FILE	13.NULL	ELONOTOE 1 ILC
290	s PRUFL	15.0.R.*******	SOURCE ISP DATA BASE
300	s PRUFL	IF.9.9.*******	ISP INDEX FILE
310	s DATA	DC	
320	ISP INDEX	FC=IF	ISP DATA CARDS
330	ISP DATA	FC=15	Ret MANUE ENT TENT DAGE
340	ISP RECORD	******	SCHOOL OF THE CALL CALLS
350	S END IOR	****	SET RECOPD PARAMETERS

Figure 7-20 Activity 2

To run the ISP Reader the following lines should be set in Figure 7-20:

Line
160 This show

This should be the ISP Reader R* file. It should be brought off the system generation tape (see Appendix G).

Contents

The core limit should be set to the size given for the ISP R* file in Appendix G. The CPU limit should be set so that the Reader can finish in the allotted time. Assume the Reader can process approximately 6000 records per hour.

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	7-23
190	The Translation Library is a library of low-level routines essential to the Reader. It can be found on the system generation tape (Appendix G).
220	The run-time parameters should be set here. There are three run-time parameters.
	 The word "FIRST" should be included on this line if and only if this is the first time the Reader has accessed the source database(s). The word "LAST" should be included in this line if and only if this is the last run on the source database. Note that if there is only one run of the Reader, both "FIRST" and "LAST" should be used. The name of database must be included on this line in the form: NAME=database-name where database-name is the name of the database and its first character immediately follows the equal sign.
∠250	The source RIF should be a random permanent file. It should be created about twice the size of all source databases.
290	The source ISP database should have filecode 15.
300	The ISP index file should have filecode IF.
320,330	These ISP data cards should be changed only if a non-standard (320 words) page size or commercial collating sequence is used in the ISP database.
340	The ISP parameters specifying record length, key size, and key offset should be set here.

7.6.3 ISP Reader Output

The output from the ISP Reader is on report code 06. The statistical report from the ISP system is on report code 73 but the user can ignore that output. An example of the first page of output is shown in Figure 7-21. After the page header, there is a line with the run-time parameters as they were listed in the run-time parameter file. The next three lines of output are initialization messages from the ADBMS system. The database which is initialized is the source RIF. If there were no errors during the execution of the Reader the next line should be the number of records retrieved from the ISP database. If there were errors during the run, the error messages will be printed after the initialization message.

The other output from the ISP Reader is a dump of a few records in the source RIF. Since this output is the same in the IDS Reader, the user should refer to Section 7.5.5 and Figure 7-17 for an explanation and sample of that

output.

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120 Sender Ou MRITTEN TO LINE STREET OF THE PRESENT OF THE PRESEN which the pace header, there is a series of the control of the con of the Pandar the next line should be printed at the printed of the printed after the initial printed at the pr THE TOTAL

7.7 Sequential Reader Files and Reports

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U	60	s FUTIL	A1.A2.RCOPY/1F/	
	70 101	S FUTIL	BI.R2.RCOPY/IF/	
	tmit os	S PRMFL	A1.R.R.*******	SDDL TABLE DATAPASE
U	90 of	FILE	A2.A1S.10R	
	100	S PRMFL	B1.R.R. ********	DDLWT WORK DB
n	110	\$ FILE	82.815.10R	

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7.7.1 Activity 1 1278 Person Shid- on severy sas

The first activity of the sequential Reader copies the source SDDL tables and an internal database used by the DDL Writer to temporary files. Line 80 (in Figure 7-22) should refer to the file containing the source SDDL tables. Line 100 should refer to the DDL Writer's work database that was brought off the system generation tape (see Appendix G). The user should check report code 53 to be sure the first activity terminated normally.

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this line in the form:

7.7.2 Activity 2

U ₁₂₀	•	NOTE	Willedatabase-name	
_130	925 7 2330	NOTE	< EXECUTE THE READER	
140	S	NOTE	<	
LI 150	\$	EXECUTE		
160	. \$	PRMFL	R*.R.S.*******	READER R* FILE
1170	\$ 6 10	FILE	H*.YIR.15R	
U180	\$	LIMITS	**.**K5K.50000	SET CORE AND CPU LIMITS
190	\$	PRMFL	TR.R.R. ******	TRANSLATION LIBRARY
7200	\$	FILE	03.BIR.IOR	DDLWT WORK DR
[210	S.,	DATA	05	
220	RUN	TIME PAR	AMETERS	
230	\$	REMOTE	06	REPORT OUTPUT
240	\$	FILE	O7.AIR.IOR	SDDL TABLE DATABASE
U250	\$	PRMFL	09.W.R.******	
250	\$	FILE	10.R2R.10L	SCRATCH FILE
1210	PINSEAS A	FILE	12.R3R.10L	SCRATCH FILE
∐280		FILE	FIS. NULL STUDE THE EMONE OF THESE	o to each indited to
290	Safashan S	PRMFL	15.R.S. ********	SOURCE SEQ. DATABASE
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	SAS DATA	on entrine	itedican modess. If there were no	altimi alfalent patron

Figure 7-23 Activity 2

Execution of the Header, the next line should be the employ of records retrieved

To run the sequential Reader the following lines should be changed in Figure 7-23:

Line	Contents		
160	This should be the sequential Reader R* file. It should be brought off the system generation tape (see Appendix G).		
180 ARI BURNT LESSON SOL SEON ENITE	The core limit should be set to the size given for the sequential Reader in Appendix G. The CPU limit should be set so that the Reader can finish in the allotted time. Assume the Reader can process approximately 6000 records per hour. The Translation Library is a library of low-level routines essential to the Reader. It should be brought off the system generation tape (see Appendix G).		
190			
220 2012 Some and code of red	the Reader has accessed the source database(s). The word "LAST" should be included in this line if and only if this is the last run on		
250 o employ	The source RIF should be a random permanent file. It should be created about twice the size of all source databases.		
290	The source sequential database should have file code 15. If the database is on a tape, the LUD used for the tape drive should not conflict with any other LUDs used by the Reader.		

7.7.3 Sequential Reader Output

The output from the sequential Reader is on report code 06. An example of the first page of output is shown in Figure 7-24. After the page header, there is a line with the run-time parameters as they appeared in the run-time parameter file. The next three lines of output are from the ADBMS system during the SRIF initialization process. If there were no errors during the execution of the Reader, the next line should be the number of records retrieved

Figure 7-23 Kebiyaba 2

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from the sequential database of there were eright forcing the run, the error databases will be returned effor the SRE indict Consequence.

The other outlest from the sequencial Reader is there of a few records in the search RIF. Since this nispul is the runs of in the INS Reader.

The other search RIF. Since this nispul is the runs of in the INS Reader.

The user should refer to Service 7.5.5 and Floure 3-11 for an employation.

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12/22/76 THE UNIVERSITY OF MICHIGAN SEQUENTIAL PEADER (VERSION IIA, RELEASE 2) FIRST LAST RUN-TIME PARAMETERS --- NAME = PRES - SEO

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50 PAGES. DATA BASE INITIALIZED WITH THE TOTAL NUMBER OF RECORDS RETRIEVED IS--->

F1gure 7-24

from the sequential database. If there were errors during the run, the error messages will be printed after the SRIF initialization message. The other output from the sequential Reader is a dump of a few records in the source RIF. Since this output is the same as in the IDS Reader, the user should refer to Section 7.5.5 and Figure 7-17 for an explanation and sample of that output.

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8.0 RUNNING THE RESTRUCTURER

The Restructurer is the second of the three major modules of the Data Translator. After the Reader has produced an ADBMS database that is logically equivalent to the original IDS source database, the Restructurer must be run to perform the logical transformations specified by the TDL. The output is another ADBMS database in relational (rather than network) form. This database is then used by the Writer to produce a logically equivalent network IDS database.

The following checklist indicates the steps of the translation process which should be completed before attempting to run the Restructurer:

- 1. The user must generate SDDL tables for both the source and target databases.
- 2. The Reader must be run to produce a source RIF database.
- 3. A TDL description of the desired translation must be written and analyzed to generate TDL tables.
- 4. A random file must be created to hold the target RIF database. Its size must be a multiple of 12 llinks (see Section 8.4.1).

When the above steps have been completed, the user is ready to run the Restructurer.

8.1 Major Components of the Restructurer

Figure 8-1 shows the major components of the Restructurer. The arrows indicate the direction of information flow among the various components. The following is a brief explanation of each:

USER-INPUT DIRECTIVES:

User-supplied statements that control various aspects of the Restructurer run (e.g., whether or not to initialize the target RIF database).

SOURCE RIF DATABASE:

An ADBMS database, output by the Reader, which is logically equivalent to the user's original IDS database.

"NAMES" TDL TABLES:

An ADBMS database, output by the TDL Analyzer, which contains all the translation information specified by the user's TDL description.

"POINTERS" TDL TABLES:

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A copy of the "NAMES" TDL tables in which all ADBMS names (e.g., record type names) have been replaced with symbolic pointers. The necessary processing is performed by the Restructurer prior to the actual restructuring of the database. This second copy of the TDL tables is used to avoid having to interpret the same ADBMS literals over and over again each time a target record is created or a source record accessed. This saves considerable processing time during the Restructurer run.

Figure 8-1
Restractorer - Nather Compuners

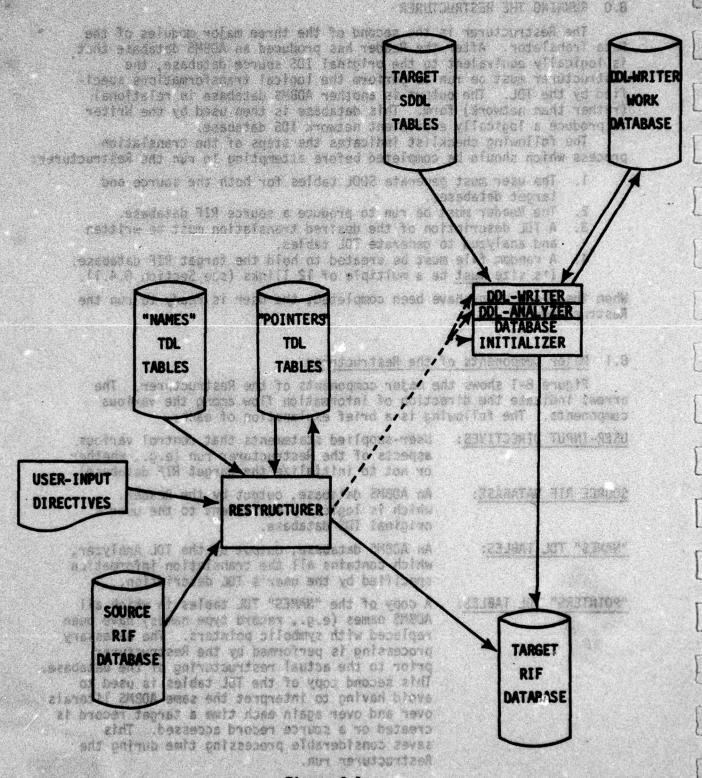


Figure 8-1
Restructurer - Major Components

RESTRUCTURER: Driven by the translation information specified in the TDL tables, the Restructurer builds the target RIF database from the data in the source RIF database.

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TARGET SDDL TABLES:

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An ADBMS database, output by the IDS Analyzer, that describes the data structure of the target RIF database.

DOL-WRITER, DOL-ANALYZER, DATABASE-INITIALIZER: Three ADBMS support podules that are called by the Restructurer to (respectively) (1) read the data structure information from the target SDDL tables and produce ADBMS DDL text which describes the target RIF; (2) analyze this DOL text to produce an ADBMS DBTF; and (3) use this DBTF to initialize the target RIF database file so that records can be stored in it.

DOL-WRITER WORK DATABASE: An ADBMS scratch database used by the DDL Writer to produce ADBMS DDL text.

TARGET RIF DATABASE:

An ADBMS database in which are stored the target record instances built by the Restructurer. This database is used as input to the Writer to produce the user's final IDS target database.

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8.2 Restructurer Processing Flow

The restructuring process consists of two phases. In Phase I, general housekeeping functions are performed: all databases are opened; the User Input Directives are processed; if directed to do so, the target RIF database is initialized; and, the "POINTERS" copy of the TDL

tables is prepared.

Phase II is the actual restructuring of the database. The Restructurer puts groups of "compatible" access paths on a "stack", and uses this "stack" to exhaustively access all source record instances (represented by the combined access paths) in a pseudo-pre-order tree fashion. For each group of source record instances accessed, the corresponding target record instances are constructed and stored in the target RIF database. When all access paths have been processed, the Restructurer is done, and a statistical summary is printed at the end of the Restructurer report.

8.3 Restructurer Control Card Deck Setup

Figure 8-2 shows the prototype control card deck setup for running the Restructurer. There are three activities: (1) make temporary copies of all databases, (2) run the Restructurer, and (3) copy the target RIF back to the permanent file.

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                           PRMFL 01.K.R. ***SOURCE RIF DATABASE***
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                         PRMFL 03.W.R. ***TARGET RIF DATABASE***
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                           FILE
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                           PRWFL 07.P.R. ***TDL TABLES DATABASE***
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                           EXECUTE DUMP NREST
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                                          R*.P.S.***RESTRUCTURER R* FILE***
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                                          12.X2R
                            FILE
 0530
                                                                       'POINTERS' TOL TABLES
                                         .13.X3R
 0540
                                                                       TARGET SDDL TABLES
                            FILE
                                         14.X4R
 0550
                                                                       DDL-WRITER WORK DATABASE
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                                      OUTPUT SINK (DDLA. DRINT)
              FILE
06 0
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              FILE
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                      USER HASH INPUT FILE TO CRINT
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                         BACK TO THE PERMANENT FILE. IF THE RESTRUCTURER ENCOUNTERED AN ERROR IN ACTIVITY 02. THE SIF CARD
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Figure 8-2 (cont'd).

10010-0710 senil

LINE NUMBER	NOTES
0020	Standard \$IDENT card
0130, 0170, 0210 0250, 0290, 0330	\$PRMFL cards for all required databases
0420 THEFT AND	\$LIMITS card for Restructurer run
0430 FIF THOSE	\$PRMFL for Restructurer R* file
0450	\$PRMFL for Translator Library file
0690-0740	Must be replaced with User Input Directives
0880	Target RIF copied back to this \$PRMFL file.

8.4 Activity 01 Control Cards

Figure 8-3 shows the control cards for Activity 01. This activity makes temporary copies of all databases to be used by the Restructurer in Activity 02.

8.4.1 File Code Assignments

Lines 0130-0140:

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.SAD WPW +1+3TF1FWF

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The source RIF database (output of the Reader) should be assigned to file code 01 via the \$PRMFL card on line 0130. The correct size parameter must be inserted in the \$FILE card on line 0140. It must be at least as large as the random file containing the source RIF database, and may be larger. For example, if

(1) Source RIF in MICHIGAN/SOURCEDB, and (2) SOURCEDB is 55 llinks,

then lines 0130-0140 should be

0130\$ PRMFL 01, R, R, MICHIGAN/SOURCEDB 0140\$ FILE 02, XOS, 5R

Note that 5 random links = 60 llinks, more than sufficient to hold SOURCEDB. SOURCEDB is copied to a temporary file (02) and saved for the next activity with LUD XO.

Lines 0170-0180:

The target RIF database should be assigned to file code 03 via the \$PRMFL card on line 0170. A corresponding size parameter should appear on line 0180. However, unlike the source RIF database, the target RIF database must be an integral multiple of 12 llinks, and the size parameter on the \$FILE card must match exactly. The reason for this is that after the Restructurer finishes storing records in the target RIF, the temporary copy is copied back to the permanent file (Activity 03). Since temporary files are always multiples of 12 llinks, the target RIF must also be a multiple of 12 llinks so that a copy can be made

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0470
              NOTE
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              NOTE
                        RESTRUCTURER ARE COPIED FIRST TO PROTECT THE
                        ORIGINALS. BE SURE TO PUT THE CORRECT SIZES
            NOTE
0800
                        (IN RANDOM LINKS) ON THE SFILE CARDS.
           NOTE
           NOTE
04 00
                     **********
010
              UTILITY
0110
            NOTE
000
            FUTIL
                     01.02.RCOPY/IF/
            PRMFL
                     O1.H.R. *** SOURCE RIF DATABASE***
0140
                     02.XOS. *** SOURCE RIF DATABASE SIZE***
              FILE
0150
            NOTE
         FUTIL
                     03.04.RCOPY/1F/
                     O3.W.R. ***TARGET RIF DATABASE***
0170
              PRMFL
                     04.XIS. ***TARGET RIF DATABASE SIZE***
0180
              FILE
          NOTE
 160
01 00
              FUTIL
                     05.06.RCDPY/1F/
0210
              PRMFL
                     O5.R.R.***TDL TABLES DATABASE***
                     06.X2S. ***TDL TABLES DATABASE SIZE***
0110
              FILE
02 10
          NOTE
                     07.08.RCOPY/1F/
0240
         FUTIL
                     O7.R.R.***TDL TABLES DATABASE***
0250
        PRMFL
01 0
            SEFILE OF
                     08.X3S.***TDL TABLES DATABASE SIZE***
0270
         NOTE
         FUTIL .
0280
                     09.10.RCOPY/1F/
       5
                     09.R.R. ***TARGET SDDL TABLES DATABASE***
04 40
              PRMFL
                     10.X4S. ***TARGET SDDL TABLES DATARASE SIZE***
03.30
              FILE
         NOTE
0310
010
              FUTIL
                     11.12.PCOPY/1F/
           被
              PRMFL
                     11.R.R. ***DDL-WRITER WORK DATABASE***
          FILE
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                      12.X55.12R
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Figure 8-3
Activity 01 Control Cards

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from and later copied back to the same file. The target RIF is copied to a temporary file (04) and saved for the next activity with LUD X1.

Lines 0210-0220:

The TDL tables database should be assigned to file code 05 via the \$PRMFL card on line 0210. A corresponding size parameter should appear on line 0220. The size of the temporary file may be larger than the permanent file, as in the example for the source RIF database. The TDL tables are copied to a temporary file (06) and saved for the next activity with LUD X2. This copy will become the "NAMES" copy of the TDL tables in Activity 02 (see Section 8.1 for an explanation of "NAMES" vs. "POINTERS" TDL tables).

Lines 0250-0260:

Same as lines 0210-0220. The same TDL tables database (file code 07) is copied to a temporary file (08) and saved for the next activity with LUD X3. This copy will become the "POINTERS" copy of the TDL tables in Activity 02.

Lines 0290-0300:

The SDDL tables database for the target database should be assigned to file code 09 via the \$PRMFL card on line 0290. A corresponding size parameter should appear on line 0300 (may be larger than permanent file size). The target SDDL tables are copied to a temporary file (10) and saved for the next activity with LUD X4.

Line 0330:

The DDL Writer Work Database (restored from the SYSGEN tape) should be assigned to file code 11 via the \$PRMFL card on line 0330. Its size is fixed at 12 random links = 144 llinks. The Work Database is copied to a temporary file (12) and saved for the next activity with LUD X5.

8.4.2 User Parameters

No user parameters are required for Activity 01.

8.4.3 Output Interpretation and Example

The output of Activity 01 is the standard \$UTILITY output and is not shown here.

8.4.4 Errors

Any error messages will be standard control card or \$UTILITY messages documented in H-6000 documentation. However, the following are some of the more elementary sources of errors:

- 1. Database file is sequential instead of random.
- Size parameter on \$FILE card is too small.
- 3. File name spelled incorrectly.

8.5 Activity 02 Control Cards

Figure 8-4 shows the control cards for Activity 02. This activity actually executes the Restructurer and produces a temporary copy of the target RIF database.

8.5.1 File Code Assignments

Line 0430:

The Restructurer R* file (restored from the SYSGEN tape) should be assigned to file code R* via the SPRMFL card on line 0430. This file contains the Restructurer object code.

Line 0450: The Translator Library file (restored from the SYSGEN tape) should be assigned to file code TR via the SPRMFL card on line 0450. This library file contains all the support routines needed by the Restructurer.

8.5.2 User Parameters

There are three areas of user input to the Restructurer run: (1) the \$ LIMITS card, (2) the User Input Directives on file code 05, and (3) optional use of \$REMOTE and \$PRMFL cards for file codes 01-04.

8.5.2.1 The \$LIMITS Card

The SLIMITS card on line 0420 must be replaced with a suitable \$LIMITS for each particular run. The following rules-of-thumb apply to runs made with #EXECUTION-MONITOR=OFF (see Section 8.5.2.2):

The CPU time required varies roughly linearly with the size of the database to be restructured. However, processor time requirements will be greater for runs with more complex access paths, more qualifications, and for runs that use user conversion and qualification routines. The general rule is: take the number of record instances in the larger of the two (source and target) databases. Divide this number by thirty (30). The result is the number that goes on the \$LIMITS card for CPU-TIME. For example, suppose the source database contained 2000 record instances, and the target database was expected to have 3000 record instances. Then 3000:30 = 100, and the \$LIMITS card would look like:

100. CORE.-5K, OUTPUT-LINE-LIMIT LIMITS

Note: this method provides a gross over-estimate so that a Restructurer run will not terminate due to lack of CPU time requested. After a few runs, the user should develop a feeling for how much time a particular run will take, and may cautiously lower his CPU limit if it is to his advantage.

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360	NOTE ******************************
370-	NOTE * ACTIVITY 02 - RUN THE RESTRUCTURER. NOTE THAT
380 1	NOTE * THE SLIMITS CARD MUST RE ADJUSTED FOR EACH
390 !	NOTE * PARTICULAR RESTRUCTURING JOB.
400	N()TE ******************************
410	EXECUTE DUMP.NREST
420	LIMITS CPU-TIME.CORE5K.OUTPUT-LINE-LIMIT
430	PRMFL R*.R.S.***RESTRUCTURER R* FILE***
440 :	CIUSATE NT OH AND
450	PRAFE TR.R.R. ***TPANSLATOR LIBRARY***
460	NOTE show transfer constant and and at the
470	NOTE
480	NOTE THE FOLOWING SIX SFILE CARDS CORRESPOND
490	NOTE TO THE SIX DATABASES COPIED IN ACTIVITY OF
500	NOTE WERE AND DEED AND SHEET AT
510	FILE 10.XOR SOURCE RIF
520	FILE 11.XIS TARGET RIF (SAVED FOR ACTIVITY 03)
530 S	FILE 12.X2R 'NAMES' TOL TABLES
540	FILE 13.X3R 'POINTERS' TOL TAPLES
550	FILE 14.X4R TARGET SDDL TABLES SHOTE SEE S. 8.8
500	FILE 15.X5R DOL-WRITER WORK DATABASE
570	NOTE
580	NOTE THE FOLLOWING FOUR SFILE CARDS ARE USED
590	NOTE IN THE PREPARATION OF THE TARGET RIF FOR
600	NOTE RESTRUCTURING
610	NOTE
620	FILE OI.NULL OUTPUT SINK (DDLA. DRINT)
630	FILE 02 DDL TEXT FOR TARGET RIF
640	FILE 03 10 25 10 DRTF FOR TARGET RIF COR TO STUDIE
550	FILE 04 USER HASH INPUT FILE TO DRINT
600	NOTE
070	NOTE
680	DATA 05COPY
090	NOTE
700	NOTE INCLUDED HERE SHOULD BE EITHER
/10	NOTE 1) USER-INPUT STATEMENTS, OR
	NOTE 2) SSELECTA TO FILE CONTAINING USER-
	NOTE INPUT SCATEMENTS
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THE RESIDENCE OF THE PARTY OF T	ENDOOR TO THE PROPERTY OF THE
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	record instances. This 3000430 * 100, and the SLIMITS card

\$ LIMITS 100, CORE, -SR, OUTPOT-LINE-LIMIT

sould look like:

a fact of stanifes - 1900 Figure 8-4 lyon Sentem first into sent UPD to Nosi of sub Figure 8-4 lyon Sentem for sent the sentember of Section 1900 Control Cards sentember 5 personner for how much them a particular run will take, and may cautiously lower big the inner if it is to his advantage.

- 2. The CORE required will almost always be 66K, since the Restructurer buffers and storage are the same for each run. The only time more core is needed is if user qualification and/or conversion routines are used (see Section 4.2.3 on user qualification and conversion routines, and Section 8.7 for modifications to Restructurer control cards).
 - 3. The default OUTPUT-LINE-LIMIT for a SEXECUTE activity (as is Activity 02) is more than sufficient if #EXECUTION-MONITOR=OFF.

If running with #EXECUTION-MONITOR=ON (see Section 8.5.2.2), the following adjustments should be made to the estimates presented above:

- Increase the number obtained in (1) above for CPU-TIME by 25%.
- The Execution-Monitor output is quite lengthy and is usually only needed when debugging a very stubborn bug in the user's TDL. If it is needed, only the access paths being debugged should be active for the run (see Section 8.5.2.2). The general rule is: take the number of record instances in the larger of the two databases. If only a few access paths are being used, this number may be scaled down by a factor equalling the fraction of the source database instances represented by the active access paths. In either case, <u>multiply</u> this number by fifty (50). This is the number that goes on the \$LIMITS card for OUTPUT-LINE-LIMIT.

Presented here is a complete example of how to estimate the \$LIMITS card. Assume the following:

- a. Source database: 2000 record instancesb. Target database: 3000 record instances
- No user qualification or conversion routines

Then, if #EXECUTION-MONITOR=OFF,

CPU-TIME = 3000 ÷ 30 = 100 CORE = 66K OUTPUT-LINE-LIMIT not needed

And the \$LIMITS card is

LIMITS 100,66K,-5K

If #EXECUTION-MONITOR=ON, then

CPU-TIME = 100 + (.25)100 = 125 OUTPUT-LINE-LIMIT = 3000 x 50 = 150,000

And the \$LIMITS card is

LIMITS 125,66K,-5K,150000

8.5.2.2 User Input Directives

The User Input Directives are read by the Restructurer from file code and are used to control various aspects of the Restructurer run. Lines 0690-0740 must be replaced (i.e., the \$NOTE cards must not appear between lines 0680 and 0750 in final form) with either the actual User Input Directives

v. All any turning function or interest and terms will be a contract to the

or with a \$SELECTA to an ASCII file containing them. A description of the various directives is presented here, followed by an example.

- 1. All User Input Directives begin with a pound sign (#). However, since TSS strips off a pound sign immediately following a file line number, two pound signs should appear with the directive so that when the User Input Processor reads file code 05, each directive begins with one pound sign.
- 2. If a pound sign is desired as the first character of a TDLAP name, two pound signs should be used (##). Again, since TSS strips off one pound sign, three pound signs must follow the file line number to indicate that the TDLAP name begins with one pound sign. Pound signs within a name need no special treatment.
- 3. No embedded blanks are allowed in any User Input Directives.
- 4. User Input Directives must begin in column one (1). The first blank encountered on a line terminates the line. User Input Directives must be one-to-a-line and may not extend over more than one line.
 - 5. The following are legal User Input Directives:
 - a. #TRANSLATION-NAME=48-character-name

This directive allows the user to put a label on the Restructurer output. The label may be up to 48 nonblank characters, and will appear in the User Input Summary and at the top of the Statistical Summary (see Section 8.5.3).

b. #RUN = { INITIALIZE CONTINUE CONTINUE

This directive determines whether or not the target RIF database is initialized before restructuring begins.

INITIALIZE - the copy of the target RIF database file is initialized before restructuring. The contents of the permanent file are not modified until Activity 03.

CONTINUE - the copy of the target RIF database file is not modified in any way. The target RIF is assumed to have been initialized (e.g., by a previous run) and may contain restructuring output (target records) from previous Restructurer runs. The output from the current run will simply be added to whatever already exists in the target RIF database.

c. #EXECUTION-MONITOR= ON OFF

This directive turns the Restructurer debug output on or off:

G000001, No. - No. - 25 (MI)

ON - debug output appears along with the Restructurer report on report code 06.

OFF - no debug output is printed.

Note: error messages always appear on report code 06, independent of the #EXECUTION-MONITOR = directive.

d. #ACTIVE-TDLAPS

This directive indicates that the following TDLAPS are to be "active", i.e., used to build target records during the Restructurer run. TDLAP names must appear one per line immediately following the directive and must start in column one (1). The appearance of the keyword ALL-TDLAPS-ACTIVE instead of a TDLAP name indicates all TDLAPS are to be used for restructuring during the run. Other rules:

- If ALL-TDLAPS-ACTIVE is used, it may not be followed by a TDLAP name.
- 2. Either ALL-TDLAPS-ACTIVE or at least one TDLAP name must follow the #ACTIVE-TDLAPS directive.
- 3. The list of TDLAP names is terminated by an end-of-file or another User Input Directive.
- 4. All occurrences of a particular TDLAP name after the first occurrence are ignored and do not produce an error message.

This directive is particularly useful for debugging one access path at a time, and for performing large restructuring operations a little at a time. For example, a particular restructuring job may take longer than the amount of continuous computer "up" time available. In cases like this, the user may make the first Restructurer run with #RUN=INITIALIZE and one or two access paths "active". Each succeeding run is then made with #RUN=CONTINUE and one or two different access paths "active" until all access paths have been processed. Thus, the first run initializes the target RIF database and stores the target records built from the "active" access paths. The target RIF database is not initialized on succeeding runs; the target records from each active access path are stored in the same database as in the first run until all restructuring is completed. The content of a target RIF database produced in this way is logically equivalent to a target RIF produced in a single run. Note, however, that if the source RIF database, source SDDL tables, and/or target SDDL tables are regenerated part way through this restructuring-by-parts process, previous runs may become inconsistent and will have to be rerun from scratch.

e. #USER-HASH-INPUT

This directive indicates that the following lines should be input to the ADBMS Database-Initializer. They will be used to modify the standard ADBMS hashing algorithm that is used to store records in the target RIF database. Use of this directive is necessary only in unusual cases when, for a particular target RIF database, the standard record storage algorithm breaks down and a different algorithm is required. This event necessitates a thorough analysis of the data before attempting to alter the record storage algorithm. Data Translation Project personnel should be consulted in the event that problems of this nature arise.

f. #END-USER-INPUT

This directive signals the end of the User Input Directives, and scanning of the directives terminates when this directive is encountered. If an end-of-file is encountered before this directive, it is assumed that the end of the User Input Directives has been reached.

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- The User Input Directives are order-independent.
- Any errors detected while processing the User Input Directives will result in the cancellation of the Restructurer run. However, all directives are always processed for errors. The same and processed portables as
- Any directive appearing more than once is considered an error.
- Certain directives must appear for each run:
 - #RUN=
 - b. #EXECUTION-MONITOR=
- #ACTIVE-TDLAPS, followed by at least one TDLAP name or by ALL-TDLAPS-ACTIVE. SA SERVE WE THE PROPERTY OF SOMETRIA

If any of the above directives is missing, it is considered an error.

- 10. Optional directives are:
 - a. #TRANSLATION-NAME= The party of the translation of the translation
 - b. #USER-HASH-INPUT
- c. #END-USER-INPUT

The absence of one or more of these is not an error.

11. Following are two examples of User Input Directives: EXAMPLE #1

File Line No.	<u>Directive</u>
10	##TRANSLATION-NAME=OLD-TO-NEW
20	##RUN=INITIALIZE
30	##EXECUTION-MONITOR=OFF
40 mm	##ACTIVE-TDLAPS
50	ALL-TDLAPS-ACTIVE
60	##END-USER-INPUT

Comments on Example #1

Line 10: Label for output

Line 20: Target RIF database is to be initialized

Line 30: No debug output is to be printed

Line 40: The following TDLAPS are to be used during the run:

d habile of participation ground side and to arrelate during to

Line 50: All of them

get apparents all pervise according a tel Line 60: End of User Input Directives

EXAMPLE #2 Thank Thereberg specient obtacles of the out tools species

File	Line No.	<u>Directive</u>
	10	##RUN=CONTINUE
da Bere	20	##EXECUTION-MONITOR=ON
	30	##ACTIVE-TDLAPS
SAME	40	PEOPLE-REC
	50	###OFFSPRING
	(60)	end-of-file

Comments on Example #2

Line 10: Target RIF database not initialized; records are stored in database along with content from previous runs.

Line 20: Debug output will be printed on report code 06. Line 30: The following TDLAPS will be "active" for the run.

Lines 40.50: The TDLAPS "PEOPLE-REC" and "#OFFSPRING" will be active. Line (60): Nonexistent; end-of-file indicates end of User Input Directives

Note: Unlike the examples above, no intervening blanks should appear between the file line numbers and the User Input Directives.

8.5.2.3 Optional \$REMOTEs and \$PRMFLs

If desired, file codes 01, 02, 03, and 04 may be assigned to permanent files via \$PRMFL cards (with <u>WRITE</u> permission) for later examination. In addition, line 0620 may be replaced by:

0620 \$ REMOTE 01

which will force (usually unnecessary) output from the DDL Analyzer and Database Initializer to appear on report code O1. This output may be useful if errors occur in one or both of these modules.

8.5.3 Output Interpretation and Example

The Restructurer Report appears on report code 06 of Activity 02. (This description is for #EXECUTION-MONITOR=OFF). At the toprof the first page will appear

#####RESTRUCTURER REPORT--VERSION IIA. RELEASE 2######

Any errors that occur between this message and the next will appear on this page. However, if all goes well, the remainder of the first page should be blank. At the top of the next page will be the message:

PHASE I - PROCESS USER INPUT FILE

User Input Processor error messages, if any, will follow. However, if no errors are detected, the remainder of the page will be blank.

At the top of the next page (following any error messages) will be the User Input Summary. The summary gives the status of each of the User Input Directives and information regarding the preparation of the target RIF database (if any occurred). An example of the User Input Summary is shown in Figure 8-5. If all User Input was correct, the last message of the summary will be "USER INPUT ACCEPTABLE."

The top of the next page should be headed by the message:

PHASE II - RESTRUCTURER BEGINS

with the remainder of the page blank (unless there are error messages). Each succeeding page will (again, if there are no errors) show a small summary of each stack built by the Stack Builder. An example is shown in Figure 8-6. The stack number simply indicates the order in which the stacks were built and accessed. A list of the access paths that were stacked together on that stack follows. Any error messages resulting from the accessing of the records on the stack will follow this list, ending with a message indicating whether or not the stack was successfully accessed.

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ACTIVE-TDLAPS

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If there were no errors in the run, the page following the summary for the last stack will be headed by the message:

PHASE II COMPLETE - RESTRUCTURER TERMINATING

If errors occurred during the run, this message will be replaced by an appropriate error message. On this and the following pages appear the Statistical Summary. The source database summary follows the above message; the target database summary begins at the top of the page following the source database summary; and the access paths summary similarly follows the target database summary. Figures 8-7, 8-8, and 8-9 respectively show examples.

Following are explanations of Figures 8-7, 8-8, and 8-9.

Figure 8-7: Source Database

The #TRANSLATION-NAME appears under "STATISTICAL SUMMARY." (If none was specified via the use of the directive, the space will be blank). Information regarding each source record type is read across the columns from left to right.

"SOURCE RECORD TYPE" column: the six-character ADBMS name (as it appears in the source SDDL tables database) of each source record type that was accessed at least once (i.e., at least one attempt to retrieve an instance, actual or null, was successful).

"ACCESSES FOR THIS TYPE" column: the number of actual record instances accessed (retrieved) for each source record type. This number does not include null instances.

"PASSED QUALIFICATION" column: for each source record type, the number of record instances that satisfied qualification criteria. This number includes null instances.

"FAILED QUALIFICATION" column: for each source record type, the number of record instances that did not satisfy qualification criteria. This number also includes null instances.

The TOTALS at the bottom of each column are simply the sums of each column. Note that in general, as in Figure 8-7, the sum of columns 3 and 4 do not add up to give the corresponding number in column 2. The reason for this is twofold: (1) column 1 counts actual record instances retrieved, not including null instances, while columns 3 and 4 do include null instances, (2) when two or more compatible access paths "share" a record on the stack, the record need be retrieved only once; then all qualifications, one for each access path, may be performed on the same record without the need to access it again.

Figure 8-8: Target Database

Always starts at the top of a new page. The structure is similar to that of the source database summary.

"TARGET RECORD TYPE" column: the six-character ADBMS name (as it appears in the target SDDL tables database) of each target record type for which at least one instance was created and stored in the target RIF.

"TOTAL RECORDS CONSTRUCTED" column: the total number of record instances of each record type that the Restructurer attempted to create. This includes duplicate records.

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"DUPLICATE RECORDS CONSTRUCTED" column: the number of duplicate (i.e., had same primary key field values) record instances of each record type that the Restructurer attempted to create. These records are never stored in the target RIF database since a duplicate instance has already been stored.

"NET RECORDS CONSTRUCTED" column: the total number of record instances of each record type that was stored in the target RIF database.

The TOTALS are again the sums of each column. However, for the target database summary, it should always be true for each row (i.e., target record type) that

MET (col.4) = TOTAL (col. 2) - DUPLICATE (col.3)

Figure 8-9: Access Paths

Gives the following information:

"STACK NUMBER" column: these numbers correspond to the stack numbers given with each short stack summary earlier in the report.

"ACCESSED SUCCESSFULLY" column: tells whether or not the corresponding stack was processed with no errors:

YES = no errors

NO = errors occurred; results from this stack are probably not consistent.

XXX = a job abort occurred while processing this stack; results are unpredictable

"SOURCE ACCESSOR TIMES IN MILLISECONDS" columns: gives timing data for each stack in milliseconds (1 second = 1000 milliseconds):

"ELAPSED TIME": the elapsed time for the accessing of the stack.

"PROC. TIME": the CPU (processor) time used for the accessing of the stack.

For example, note that stack number 1 took an elapsed time of 86.398 seconds to process while using up 22.137 seconds of processor time. These times give an indication of the relative complexities of and the number of source record instances corresponding to the various access paths.

"ACCESS PATH INSTANCES FROM STACK" column: for each stack, the number of access path instances from all the access paths on the stack. Each access path instance corresponds to one record instance creation by the Restructurer. The TOTAL for this column should equal the TOTAL for column 2, "TOTAL RECORDS CONSTRUCTED", from the target database summary.

"ACCESS PATHS ON STACK" column: a list of the access paths on the corresponding stack. For example, in Figure 8-9, the access paths named PRES, MARR, OCCUPATION, and RELA were all processed together (because they were compatible) on stack number 1.

"ACCESS PATH INSTANCES FROM A.P." column: same as "ACCESS PATH INSTANCES FROM STACK", except for each access path.

The TOTALS are again the sum of the corresponding columns. The final message should be the "DONE" message following the Access Path Summary, as shown in Figure 8-9.

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Some Final Notes on the Restructurer Report

- 1. An error-free run should be mostly empty space; the numerous page skips make the report easier to analyze in the case of numerous errors.
- 2. The Statistical Summary may be inconsistent for runs that were aborted or in which errors occurred.

8.5.4 Errors

The Restructurer is designed to continue executing in spite of errors as long as they are not of a nature that would make further execution useless (e.g., unable to open a database). Extensive error messages are provided and printed out on report code 06 along with the Restructurer report. Appendix D contains an explanation of all Restructurer error messages and suggests possible sources of most errors.

Most Restructurer error messages begin with six asterisks (******). #EXECUTION-MONITOR debug messages always begin with six pound signs (#####).

8.6 Activity 03 Control Cards

Figure 8-10 shows the control cards for Activity 03. If the Restructurer run (Activity 02) was successful, the temporary copy of the target RIF database is copied back to the permanent file. If the run had errors in it, the \$IF card (line 0840) will cancel Activity 03 to avoid destroying the old contents of the permanent file with a bad database.

8.6.1 File Code Assignments

Line 0880: the target RIF database should be assigned to file code 02 via the \$PRMFL card on line 0880. No size parameter is needed. This should be the same permanent file as that assigned to file code 03 in Activity 01.

8.6.2 User Parameters

No user parameters are required for Activity 03.

8.6.3 Output Interpretation and Example

The output of Activity 03 is the standard \$UTILITY output and is not shown here.

8.6.4 <u>Errors</u>

Any error messages will be standard control card or \$UTILITY errors, documented in H-6000 documentation. Common errors are mentioned in Section 8.4.4.

0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	S NOTE S NOTE S NOTE ACTIVITY O3 — COPY THE NEW TARGET RIF DATABASE S NOTE BACK TO THE PERMANENT FILE. IF THE RESTRUCTURER S NOTE ENCOUNTERED AN ERROR IN ACTIVITY O2. THE SIF CARD MILL PREVENT OVER-WRITING THE OLD TARGET DATABASE NOTE FILE WITH THE (POSSIBLY INCONSISTENT) NEW ONE: NOTE S NOTE THE 35.ENDJOB UTILITY FUTIL O1.02.RCOPY/IF/ FILE O1.X1R PRMFL O2.W.R.***TARGET RIF DATABASE*** ENDJOB
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U U	Figure 8-10 Activity 03 Control Cards
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8.7 Modifications to Restructurer Control Cards for User Routines

The control card setup for running the Restructurer that was presented in Sections 8.3-8.6 must be modified if user qualification and/or conversion routines were specified in the TDL description (see Section 4.2.3). The object code for each user routine must be inserted into the Restructurer R* file along with the normal Restructurer object code. The modified R* file is then passed to Activity 02, where dynamic linking and loading are used to interface with the user routines.

Figure 8-11 shows the extra control cards required to run the Restructurer with user routines. This set of control cards is inserted between lines 0020 and 0030 of Figure 8-2; it then becomes Activity 01. Activity 02 is now the \$UTILITY copy of all databases; Activity 03, the Restructurer; and Activity 04 copies the target RIF database back to the

permanent file.

<u>Line 0030</u>: the Restructurer R* file (restored from the SYSGEN tape) must be assigned to file code *R via the \$PRMFL card on line 0030.

Line 0060: this card copies the Restructurer object code from file code *R to file code R* up to the subroutine TDBSTA, which is the last subroutine in the Restructurer R* file. The object code for the user routines is inserted into the modified R* following this subroutine. This card should not be modified in any way.

<u>Line 0140</u>: "USER-NAME" must be replaced by the six-character name that appeared in a "WHEN QUALIFIED BY" or "CONVERT WITH" clause in the user's TDL description. Remember that this name cannot be the same as the subroutine name.

Line 0150: "SUBNAM" must be replaced by the subroutine name of the user routine.

Line 0160: "OBJECT-FILE" must be replaced by the file in which the user routine object code resides.

<u>Lines 0140-0160</u> are repeated for each user routine. <u>Line 0430</u> of Figure 8-2 must be replaced by

S FILE R*.ROR

The CORE option on the \$LIMITS card (line 0420 of Figure 8-2) should also be increased from 66K according to the size of user routines. Finally, all the \$NOTE cards in Figure 8-11 (lines 0080-0130 and 0170-0180) should be deleted before inserting it into Figure 8-2 (see example below).

As an example, assume the following clauses appear in the TDL

description:

... WHEN QUALIFIED BY UQUAL1

... CONVERT WITH UCONVI

... CONVERT WITH UCONV2

Assume also that the user has written the following subroutines and compiled them into the corresponding files:

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UQUALT		UUQUAT	MICHIGAN/UUQUA1.0
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UCONV2		UUCON2	MICHIGAN/UUCON2.0

04:00

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Figure 8-12 shows the control cards that must be inserted between lines 0020 and 0030 of Figure 8-2. Recall also that line 0430 of Figure 8-2 must be altered along with the \$LIMITS card (line 0420), as specified above.

A final note on using user routines: it is suggested that the user adopt a naming convention such as beginning all "WHEN QUALIFIED BY," "CONVERT WITH," and user routine subroutine names with a double consonant (e.g., "ZZUSER"). This will avoid control card and loader errors caused by a user routine or \$LINK name having the same name as a Restructurer subroutine or \$LINK name.

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	0070	•	INCLUDE		
Π	0080	•	NOTE		
U	0090	•	NOTE		
	0100	•	NOTE	THE NEXT THREE	CONTROL CARDS MUST BE
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	0120	•	NOTE	ROUTINE TO BE	INCLUDED FOR THE RUN.
	0130	•	NOTE		
	0140		LINK	USER-NAME	NAME FROM TDL DESCRIPTION
11	0150		ENTRY	SUBNAM	CONTROL TRANSFERRED TO THIS SUBR.
U	0160	8	SELECTD	OBJECT-FILE	OBJECT CODE FOR USER ROUTINE
	0170	•	NOTE		
П	0180	8	NOTE		
Ш	0190		ENDEDIT		
	0200		ENDCOPY		

Figure 8-11

Restructurer Control Cards Required When Running with User Routines

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0150	that the	ENTRY	UUCON1
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0150	•	ENTRY	UUCON2
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0190		ENDEDIT	
0200	5	ENDCOPY	

Figure 8-12

Example Control Cards to Insert User Routines into Restructurer R*

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Figure 8511

Restructurer Control Cards Required When Running With Utur Routhess

9.0 RUNNING THE WRITER

As the final step in data translation it is necessary to transfer the record instances from the target database produced by the Restructurer (the target RIF) which is in a relational form supported by ADBMS to the user's target IDS database(s). This process is known as writing and is performed by the Writer. The Writer's sole duty is to preserve within the new target IDS database(s) all record and relation instances represented in the target RIF. As noted previously in the User Manual, the Writer will produce only target IDS databases (not ISP or sequential files). Up to five different

IDS databases can be written from a single target RIF file.

For very large target databases, the Writer has a useful feature which permits partial database writes. This allows the user to split the execution of the Writer into different machine-time runs in case computer resources are restricted. For example, assume a database comprises record types A-Z, each of which consists of 2,000 instances. Further assume that no more than two hours of CPU time are available in any one block. Since it is not possible to write out 52,000 records in less than two hours, the partial database write feature can be employed to permit the user to store record types A-F on one run, to process record types G-R the next day, and finally, at a later date, finish the writing with record types S-Z. This feature is described in complete detail in Section 9.7.

Before executing the Writer it is necessary that all Data Translator steps have been successfully completed. These steps are summarized below.

- 1. Write source and target IDS MD sections.
- Write and analyze the source and target extended (with level 61 entries) IDS MD sections. Use the IDS Analyzer yielding source and target SUDL tables.
- 3. Ensure that the Reader produces the source RIF database from up to five source IDS, ISP or sequential files (or combination thereof).
 - 4. Write and analyze Translation Definition Language statements by using the TDL Analyzer to produce TDL tables.
 - 5. Execute the Restructurer to output a target RIF which contains up to five target IDS database records.

The user additionally must create via FILSYS, IDS database files (subfiles, if desired) with the desired IDS attributes (PAGESIZE, INVENTORY, etc.) for each of the target IDS databases represented in the target RIF. Care must be taken to ensure that the database size is large enough or the Writer will have to be rerun.

WARNING: It is absolutely imperative that the description of the physical layout of target IDS records in the target MD section and the extended target MD section match each other perfectly. Specifically:

- 1. All items in the IDS MD and extended IDS MD sections must have the same relative order and length.
- The 98 level entries must appear in exactly the same order in both target IDS MD and extended IDS MD sections.

- The record type values (e.g. TYPE IS XXX) must be identical for each record in both target IDS MD and extended IDS MD 983 98420532 sections.
 - The class (e.g. CALC, PRIMARY, SECONDARY) of a record must be the same in both target IDS MD and extended IDS MD 4. sections.

whose statement of the western seem to make the setting and the contract of the 9.1 Detailed Overview of Writer Execution

Executing the Writer requires five activities (with activity 2 being deleted if the second through nth run of a partial database write is being done). These are denoted as follows.

Activity

This Feeture is

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UTILITY copy of target RIF database into a temporary file.

are restricted. For exemple, assume a deficience comprises refu

2 IDS QUTI execution on the target IDS database being written. brown monte of Note that this activity cannot be performed if partial database writing is in progress. If three executions of the Writer are required to produce one target IDS database, then QUTI should be called only for the first run, not the second or third, or the page header records will be overwolled the intermewritten. The proof the contract the contract and a west adole

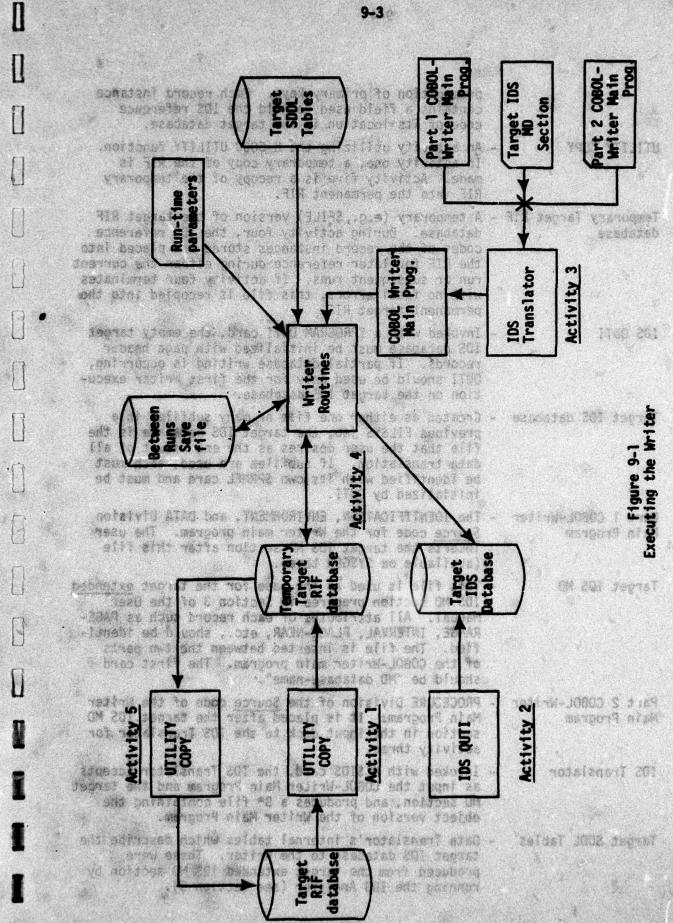
Compile the target IDS MD section into the COBOL portion of the Writer. Because the Writer uses IDS routines to lo (gyel natw) store and link records, object-time version of the target sorupe parblaky IDS MD section must be available at execution time. Hence, the user is supplied with the source code for the COBOL portion of the Writer, in which the user must insert the target IDS MD section, compile, and then execute in activity four. See Section 9.6 for complete details.

Execute the Writer. The compiled COBOL program from 4 aremestale a activity three calls in the Writer routines supplied on an R* file. User parameters are supplied to specify which database and which records within that database are to be written. A permanent record is made of which records Files (supplied were written if a partial database write is in progress. 5

If the Writer executed with no fatal errors, the temporary copy of the target RIF (modified during activity four) is recopied back into the original target RIF file. Subsequent partial database writes require that the target RIF file (modified for any given run ! by activity four) be the target RIF for the next run i + 1.

The Writer execution is illustrated in Figure 9-1. Each component of the job is summarized below.

Target RIF database - Output PRMFL of the Restructurer. It is an ADBMS database containing the representations of up to five target user databases. All record instances racily the same quality of a given type are linked together. Relation (set) anothmas (Mr. 8 instances are maintained in a relational way by



UTILITY COPY

propagation of primary keys. Each record instance contains a field used to hold the IDS reference code of its location in the target database.

- An activity utilizing the H-6000 UTILITY function. In activity one, a temporary copy of the RIF is made. Activity five is a recopy of the temporary RIF into the permanent RIF.
- database
- Temporary Target RIF A temporary (e.g., \$FILE) version of the target RIF database. During activity four, the IDS reference codes of the record instances stored are placed into the RIF for later reference during either the current run or subsequent runs. If activity four terminates with no fatal errors, this file is recopied into the permanent target RIF.

IDS OUTI

- Invoked with a \$PROGRAM QUTI card, the empty target IDS database must be initialized with page header records. If partial database writing is occurring, QUTI should be used only for the first Writer execution on the target IDS database.

Target IDS database - Created as either one file or many subfiles in a previous FILSYS job, the target IDS database is the file that the user desires as the end result of all data translation. If subfiles are used, each must be identified with its own \$PRMFL card and must be initialized by OUTI.

Part 1 COBOL-Writer Main Program

- The IDENTIFICATION, ENVIRONMENT, and DATA Division Source code for the Writer main program. The user inserts the target IDS MD section after this file (available on SYSGEN tape).

Target IDS MD

- This file is used as the base for the target extended IDS MD section prepared in Section 3 of the User Manual. All attributes of each record such as PAGE-RANGE, INTERVAL, PLACE-NEAR, etc., should be identified. The file is inserted between the two parts of the COBOL-Writer main program. The first card should be "MD database-name".

Part 2 COBOL-Writer Main Program

PROCEDURE Division of the Source code of the Writer Main Program. It is placed after the target IDS MD section in the input deck to the IDS Translator for activity three.

IDS Translator

- Invoked with a \$IDS card, the IDS Translator accepts as input the COBOL-Writer Main Program and the target MD section, and produces a B* file containing the object version of the Writer Main Program.

Target SDDL Tables

- Data Translator's internal tables which describe the target IDS database to the Writer. These were produced from the target extended IDS MD section by running the IDS Analyzer (see Section 5).

Run-time parameters - Specification to the Writer to indicate which of the databases (of five possible) in the target RIF is to be written into an IDS database. Directives ne potalestan stating concerning total or partial database writing are mercora 201-30505 Foeta supplied. Between runs save - If partial database writes are being used, it is necessary to store information concerning which records file were written on each partial execution. This information is maintained in a file which is sequential (two links is sufficient). There must be one "between runs save file" per target database. The Writer R* file (available on the SYSGEN tape). Writer routines Harrison and editions A.A. 4279753A 4.3.9 EDWART! 9.2 Explanation of Processing Flow This section sketches a brief overview of the algorithms, inputs and outputs of the entire Writer execution. Note that at minimum, the Writer must be executed once per target database to be written. Additionally, each database write can be separated into partial database writes if computer resources are limited. 9.2.1 Activity 1 - Utility Copy of Target RIF Outputs Inputs 1. PRMFL for target RIF database 1. FILE for RIF database application expectate that were but a relation as ten Algorithm are sepres more anyone, party shares to assign to A \$FUTIL filecode, filecode, RCOPY/1F/ directive is supplied to UTILITY. A. Martiols and Parties are now 9.2.2 Activity 2 - Initialize IDS database ad Inputs as found we so ent to the term of antimal and Outputs and bossic are 1. An empty IDS database represented 1. An initialized IDS database when saudtiful by either multiple \$PRMFLs if subfiles a) 1 SPRMFL to July hat are used a specially of the appropriate and to smor no IIA Directives to initialize the IDS database at the second of months and of posture and to sensit (keit bes TRAY' to wino) Algorithm the user must supply to the writer a beingrad true off Each subfile must have its own IDS INITIAL directive for its page-range. Note that this activity should not be included if the Writer execution is not the first run on a given database file. That is, if n partial writes are required to produce one target IDS database, QUTI should be used only for the first run.

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9.2.3 Activity 3 - Compile COBOL-Writer Main Program Inputs Outputs

Source code for part 1 of the 1. A B* file containing an Writer Main program

- 2. User's target IDS MD section
- 3. Source code for part 2 of the Writer area .IDS.. Main program 3000 1800 000 000 000 000 000 0000 er Holder 4177 and bestepated if opta

object COBOL-IDS program with the target IDS database represented by the common

A simple COBOL-IDS compile activity is performed. No permanent object file is required.

9.2.4 Activity 4 - Execute the Writer

Inputs

- 1. Run-time parameter file
- 2. Target SDDL tables 2. Error report
- isia stor increozers
- 4. Target RIF file (temporary copy) 4. Updated Target RIF file

Outputs

- 1. Execution report
- 3. Between runs save file 3. Target IDS database

 - 5. Updated between runs save Asia detection to read you file . I province

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Algorithm

Activity 4 can be viewed in the following two ways.

a) Multiple and partial database writing.

b) Process of transferring records from target RIF to the target as be IDS: file. suitement Allewicos , abotetil , abotetil 121072 A

A. Multiple and Partial Database Writing

adulaturo.

The control over which database to write is determined by which values are placed on the run-time parameter cards. The user must specify the following: iciaint of it. Estreolympus ecodotes 201 years of in

- 1. Database name
- 2. First run for this database? (YES or NO)
- 3. All or some of the records for the database being written (ALL or
- With pution to tall alter the Names of the records to be written for this partial database write (only if "PART" specified).

The user must supply to the Writer a permanent file in which notation of the record types written for each partial database write is made. A separate linked file is necessary for each target database. This file is known as the between runs save file. It need not be supplied if a total database write is in progress. However, it must be supplied for every partial write execution if partial writes are used. The flowchart below summarizes the steps that the user must take. Section 9.7 has the complete syntax rules for the runtime parameter file.

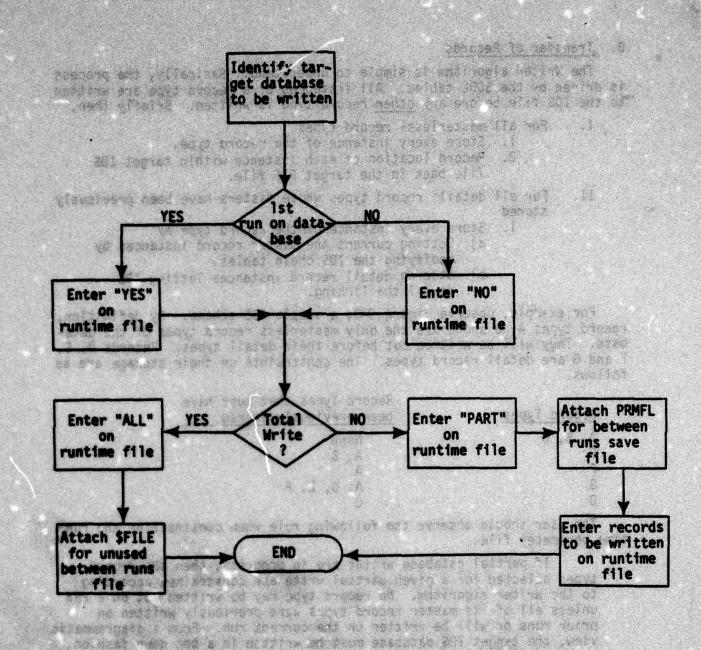


Figure 9-2
Run-time parameter file

William IA a proceed the paragraph 200 me see on call but of suit of such a fine and in the first

activity is addition to princip database with in-

William of the of the protection, and the control of

stalling which one dwoterlade rected. Figure 9-4 things sample correct.

B. Transfer of Records

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The Writer algorithm is simple to understand. Basically, the process is driven by the SDOL tables. All instances of a record type are written to the IDS file before any other record type is written. Briefly then,

- I. For all masterless1 record types
 - 1. Store every instance of the record type.
 - 2. Record location of each instance within target IDS file back in the target RIF file.
- II. For all detail² record types whose masters have been previously stored
 - 1. Store every instance of the record type by
 - a) Setting current the master record instances by modifying the IDS chain tables.

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b) Storing detail record instances letting IDS do all the linking.

For example, observe Figure 9-3, a sample IDS schema. By definition, record types A, B and C are the only masterless record types of the database. They will be written out before their detail types. Records D, E, F and G are detail record types. The constraints on their storage are as follows.

Record 1	Types Topic Topic		ypes that viously st	must have ored
A, B, C		None A, B	AT 19N	
Ē	Specifical parties of the speciments of the spec	A		
Ď	-	Ĉ, D	, E, F	

The user should observe the following rule when constructing the runtime parameter file.

If partial database writes are in progress, then the record types selected for a given partial write are constrained according to the Writer algorithm. No record type may be written out on a run unless all of its master record types were previously written on prior runs or will be written on the current run. From a diagrammatic view, the target IDS database must be written in a top down fashion, starting with the masterless records. Figure 9-4 shows sample correct and incorrect partial database write sequences. Remember that the QUTI activity is used only for partial database write #1.

A masterless record type is defined to be an IDS record that is either a) a CHAIN DETAIL of zero chains.

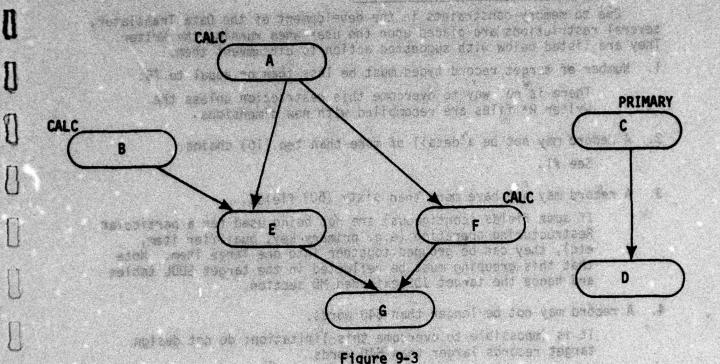
b) a CHAIN DETAIL of only the CALC CHAIN.

A detail record type is defined to be an IDS record that is a 98 CHAIN DETAIL of one or more non-CALC chains.

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Sample IDS Schema

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enace talears a	Correct	Correct	Incorrect to another
Partial Run #1	A, B, E	B, C, D	A, B, D which has not been stored)
Partial Run #2	F.G (40 17 gantaire C galagmanda	A, F	G (records E and F are not being written this run and were not written on run #1)
Partial Run #3	C	E, 6	E, F, C
Partial Run #4	D	32 36 38 32 3	and at extend on editors.
ENEL FORTHER BY	2 01 237000	1984 (447)	entre 6 and anothern of the

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Figure 9-4
Partial Database Write Sequences

9.2.5 Processing Limitations on Writer

Due to memory constraints in the development of the Data Translator, several restrictions are placed upon the user when running the Writer. They are listed below with suggested action to circumvent them.

1. Number of target record types must be less than or equal to 75.

There is no way to overcome this restriction unless the Nriter R* files are recompiled with new dimensions.

- A record may not be a detail of more than ten (10) chains.
 See #1.
- 3. A record may not have more than sixty (60) fields.

If some fields (contiguous) are not being used for a particular Restructuring operation (e.g. primary key, qualifier item, etc), they can be grouped together into one large item. Note that this grouping must be reflected in the target SDDL tables and hence the target IDS extended MD section.

4. A record may not be longer than 640 words.

It is impossible to overcome this limitation; do not design target records larger than 640 words.

5. An item may not be longer than 255 characters.

This is an ADBMS restriction. To avoid it, subdivide the "long" item into smaller (< 255) items. Subject to restriction #3 above.

6. Contained-in-repeating groups, match-key and phantom pointer relations cannot be produced in the target database.

None of the above constructs should be in the target database. Such features are not under the control of IDS and are therefore undesirable.

7. The number of masterless record types may not exceed fifty (50).

Short of redesigning the target database, there is no way to avoid this limitation except to recompile the Writer R* file.

9.3 Complete JCL to Execute the Writers

Figure 9-5 is the complete listing of control cards necessary to execute the Writer in one job. The sequence of control cards is available on the SYSGEN tape and must be modified according to which files the user is supplying for a given run. User changes to the control card sequences are listed below by line number.

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HE WELLER TON TOTAL TRANSPORTER AND THE ACTUAL TOTAL TOTAL TRANSPORTER AND THE ACTUAL TRANSPORTER AND	
TARGET REF INTO THE PART THE	Any voice very Description and a con
# 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	The PRMFL for the target RIF database
	produced by the Restructurer
0110	The size of the target RIF in random LINKS. Note that the target RIF size
RIF IN LINES	must be a multiple of 12 LLINKS or
* TODGET A 40 MUS TESTS	within UTILITY.
* O200 WOITA IT SHOW OF	
SEASATATEST TAGE	filecode of Any subfiles must have filecodes in sequence from X1,X2Xn.
0220	IDS INITIAL directives must be supplied
SARAT	for each subfile present. The entire range of pages must be initialized.
0270 25AFATA	STATE OF THE PROPERTY OF THE P
AND THE THE THE PROPERTY AND THE AND THE PROPERTY OF THE PROPE	1 of the COBOL-Writer Main program. Must
0280	ASCII file containing a legal target IDS
V280	MD section that was used as a base for
5 39 30	subsequently by the IDS Analyzer.
******0290	Source code file from SYSGEN tape of part
本本事成立在公司等等等表表表表表表表表表表表表表表表表表表 第	2 of the COBOL-Writer Main program. Must be an ASCII file.
0340	The R* file of the Writer available on
	the SYSGEN tape.
0360	
TAUPER HEITEL	restriction is computed using a guideline
zas Zas	of 13,300 record instances/CPU hour.
0400 BARTSHARAR TURNI 8	PRMFL containing the target SDDL tables produced by the IDS Analyzer.
0420-0430	Run-time parameter specifications contain-
	ing the name of the database being written and any information regarding partial data-
IF ALL RECORDS ARE DUITION THIS RUN	base writes. See Section 9.7 for exact
V NO. 21 2JUS SUAR CHUR HEST	format.
0440-0510	depending on whether a between runs save
APAGE	file is needed for this execution. All
ARY Carthertascanderscanderschanger	a permanent between runs save file.
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J & STATE OF MAKE STATES	****************

```
9-12
0010
             IDENT
                    ************************
0020
             NOTE
                              EXECUTE THE WRITER JCL
0030
             NOTE
0040
             NOTE
                         UTILITY COPY OF TARGET RIF INTO TEMP. FILE
0060
             NOTE
                    0070
             NOTE
0080
             UTILITY
                    A1,A2,RCOPY/1F/
0090
             FUTIL
                                                        的轉換
                    A1,R,R,TARGET RIF FILE
0100
         PRMFL
        FILE A2, X18, SIZE OF TARGET RIF IN LINKS
0110
          0120
         NOTE IF THIS IS THE FIRST RUN ON A TARGET
0130
                         DATABASE, THEN INCLUDE THIS ACTIVITY,
0140
             NOTE
                     ELSE SKIP DOWN TO THE COMPILATION
             NOTE
0150
        van ta
0160
        知识特
0170
                           INITIALIZE TARGET IDS DATABASE
             NOTE
                    *********************************
0180
0190
       PROGRAM GUTI
0200
             PRMFL X1, REC, R, TARGET IDS DATABASE
0210
           DESIGNATION INTERNATIONAL PROPERTY
             INITIAL PAGE RANGE OF TARGET DATABASE
0220
       IDS
0230
                    ***********************************
0240
             NOTE
                         COMPILE THE MD SECTION INTO THE WRITER
0250
                    *************************
             NOTE
0260
         Jeog of DS cs
                    NDECK
0270
       SELECTA COBOL-WRITER SOURCE CODE PT. 1
0280
        SELECTA TARGET IDS MD SECTION
0290
             SELECTA COBOL-WRITER SOURCE CODE PT. 2
0300
                    **********************************
             NOTE
        or to a
0310
             NOTE
                              EXECUTE THE WRITER
          ME
0320
             NOTE
                    EXECUTE NREST
0330
                    R*,R,S,WRITER R*
0340
        no a FriePRMFL to 1
                    H*, H1R, 20R
0350
             FILE
                                     USE APPROP. TIME REGMNTS
0360
                    XX,52K,-2K,10000
             LIMITS
                    02,X1S
                                     TARGET RIF
0370
             FILE
                                                        DUEC
                          Dainted vestrict
0380
             REMOTE
                    06
                                     EXECUTION REPORT
                      restriction is com
        Techig
                    07
0390
             REMOTE
                                     ERROR REPORT
                    08.W.R.TARGET SDDL TABLES
0400
             PRMFL
0410
             DATA
                                     USER INPUT PARAMETERS
                     PRWTL containing the
0420
       DATABASE NAME
       SPECIFICATION OF RECORDS TO BE WRITTEN
0430
       Sonos Si
             NOTE -
0440
0450
     says from pin
                         INCLUDE EITHER-
             NOTE
        NOTE - $ FILE 16,X2R,2L
                                        IF ALL RECORDS ARE WRITTEN
0460
0470
                           confirm cont
                                            THIS RUN
             NOTE THE TOTAL
0480
             NOTE
                              OR-
                         PRMFL 16, W. S. BETWEEN RUNS SAVE FILE IF ONLY
0490
             NOTE
             NOTE 6 70 - ... 61
                                    PARTIAL DATABASE WRITE IS MADE
0500
       STAR LINE NOTERING
0510
                    X1, REC, R, TARGET IDS DATABASE
             PRHFL
0520
             PRMFL TR,R,R,TRANSLATOR LIBRARY
0530
           0540
                         GO TO ENDJOB IF UNSUCCESSFUL WRITER RUN
0550
             NOTE
             NOTE
                             ELSE COPY UPDATED RIF BACK TO PRMFL
0560
0570
             NOTE
                    /35.ENDJOB
0580
             IF
0590
             UTILITY
                    A1,A2,RCOPY/1F/
             FUTIL
0600
                    A1,X1R
0610
             FILE
                    A2, W.R. TARGET RIF FILE
0420
             PRMFL
0630
             ENDJOS
```

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	u	11	- 4020	
B	AL.	44	-46	
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2000	8	Sec.	333	980
87	77	200	-102	
題り		1	166	

0530

0620

Description

Target IDS database, same as in line 0200. X1 is the required filecode. If subfiles are used then the filecodes must be in sequence from X1, X2, X3 ... Xn.

Object time random library of Data Translator routines available from SYSGEN tape. Must be attached to filecode TR.

Target RIF file name, same as line 0100.

12

Note that lines 0190 through 0220 are not included for partial database writes that are the second or subsequent runs on the given IDS database file.

9.4 Activity 1 - Utility Copy of Target RIF

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5 (0)	IDENT NOTE ************************************	
s. 11 i	NOTE * UTILITY COPY OF TARGET RIF	* INTO TEMP. FILE *
\$ [UTILITY	Pressmont very
s 1	FUTIL A1,A2,RCOPY/IF/ PRMFL A1,R,R,TARGET RIF FILE FILE A2,X1S,SIZE OF TARGET RIF IN LII	enoli "

Filecode Cont	baseksaang bu	s therefor <u>du</u>	<u>De</u>	scription	brighter?
Al				target RIF	produced by
" agreem?"	. Heveda Jos	aelus aestos	the Rest	逐步 选择 对于失源 4-30年	thereand i
A2	•	X1S	Temporar	y file of si arget RIF.	ze equivalent
		. restrict nerve	random f		1 1001254

on the laterage of the IDS of the condemn team and

Action: Correct directive(s) and regard United.

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User Parameters sufficient partitions some francist in

None

Example of Output

Output is normal UTILITY output and hence is not shown.

Possible errors

The user should check report code 53 to see if the message "RCOPYD 1 FILES" is printed. Any other result is an error in control cards. Correct if necessary and rerun.

s till	Activity 2 - Initialize Target IDS Database NOTE	** * * * * *
s 00	PRMFL X1.REC.R.TARGET IDS DATABASE	
s IDS	DATA I* INITIAL PAGE RANGE OF TARGET DATABASE	
File		
ХI		-
* 11	Directives to initialize each IDS subfile page range. Only one INITIAL directive is required if subfiles are not present.	00 No. 65 Apr.
User	<u>Parameters</u>	\$ \$
	None	
<u>Exam</u>	Standard IDS QUTI output. It is therefore not presented here.	
Poss	tible Errors 129 regret to AMP	
l;	Incorrect directive syntax, e.g. column rules not obeyed, "INITIAL" spelled wrong, etc.	
	Action: Correct directive and rerun Writer.	
, 2.	Incorrect page range specified; the INITIAL directive must specify the page numbers of the IDS file (or subfile) as it was created.	

Activity 3 - Compile COBOL-Writer Main Program Pridity Common of Justice

Action: Correct directive(s) and rerun Writer.

************ NOTE NOTE * COMPILE THE MD SECTION INTO THE WRITER * IDS NDECK TOTAL IN A STURM SHALL WARRING AS TO A STATE OF THE PARTY OF Corre SELECTA COBOL-WRITER SOURCE CODE PT. 1 SELECTA TARGET IDS MD SECTION SELECTA COROL-WRITER SOURCE CODE PT. 2

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Example of Desput

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Resultant file from \$SELECTA-ing the COBOL-Writer Main program part I, target IDS MD section and COBOL-Writer Main program part II in that sequence. Used as source IDS program input to the IDS Translator. A \$ FILE *3 may be required for large databases.

User Parameters

Examples of Output

Standard compilation output from IDS then COBOL. It is therefore not presented here.

SECTION DEL TE

Possible Errors

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IDS errors - any possible errors that IDS can detect could appear. However, since the target MD section was used as a base for the target extended MD section (and hence target SDDL tables) any errors appearing this late in the sequence of translation could cause rerunning of the IDS Analyzer on the target, TDL Analyzer and Restructurer. The user should have noted in Section 3 the requirement that the base for the extended MD section must be a legal MD section with no errors. If all translation steps have been followed, especially the rules in Section 3. then no errors should occur in activity three of the Writer.

Action: If any of the following errors occur, and the same error is present (but undetected) in the target IDS extended (with level 61s) MD section, then the user must backtrack and recreate the target SDDL tables (after fixing the target MD and extended MD sections) and hence the TDL Analyzer and Restructurer must be rerun.

CHAIN errors (Missing masters, details, loops)

RECORD errors (invalid TYPE, incorrect PRIMARY or CALC specication)

The inordinately high cost of recovery from these errors makes their avoidance essential. Carefully following the rules presented in Section 3 and the IDS Programmers Guide is necessary.

COBOL errors - will be of the following two types:

- a) Errors which use a Writer reserved word as a data item in the target MD section. This error cannot be detected by the IDS Analyzer.
 - COBOL Data Division errors; invalid PICTURES, misspelled keywords, missing punctuation or incorrect SIZE clauses. Not all of these errors could have been previously detected unless the user had followed the advice of Section 3 and compiled the target IDS MD section into a dummy COBOL program to detect any COBOL ERRORS.

Action: If the user chose a Writer reserved word as a data item name, change the name to an unused one and rerun the Writer. If a COBOL error occurred in the Data Division and that error is present in the extended target IDS MD section, then the target SDDL tables must be recreated, and the TDL Analyzer and Restructurer rerun. Again note the high cost of this error and the emphasis on avoidance.

9.7 Activity 4 - Execute the Writer

\$	NOTE	**************
5	NOTE	* EXECUTE THE WRITER *
\$	NOTE	****************
4	EXECUTE	NREST
•	PRMFL	R*,R,S,WRITER R*
	FILE	H*, H1R, 20R and 201 and 1 Juntos mortisticano brancas:
	LIMITS	XX,52K,-2K,10000 USE APPROP. TIME REGMNTS
	FILE	02,X1S TARGET RIF
	REMOTE	06 EXECUTION REPORT
	REMOTE	07 ERROR REPORT
-	PRMFL	08,W,R,TARGET SDDL TABLES
24676	DATA	15 USER INPUT PARAMETERS
DATA	BASE NAME	con teatros 1902 factor comen bits controva of baccagas
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	NOTE	- \$ FILE 16, X2R, 2L IF ALL RECORDS ARE WRITTEN
5	NOTE	THIS RUN
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\$ 4.91	NOTE	- PARTIAL DATABASE WRITE IS MADE
\$ 3.544	NOTE	
PARTIES AND DESCRIPTION		
3	PRMFL	X1,REC,R,TARGET IDS DATABASE TR,R,TRANSLATOR LIBRARY

<u>Filecode</u> <u>LUD</u>	Description
B* (not shown)	Output from COBOL-IDS compile from activity three.
R*	Writer R* file from SYSGEN tape.
Pollowing two types: "Tear reser gin ward as a data item +n " a. This arrow cannot se detected by	Temporary random file for Loader H* file. Must be supplied so entry can be made in PAT.
errors, inv erx FicTURES, misspell 20 sctuation or incorrect Silf clauses. Are could have been previously detacted	Temporary RIF database from activity one.

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unless the user has fellowed the advice of Sergion 3 and compy? Fed the cardet IDS MD section into a during COBOL

(taged leffelds breezes petertification forms (1841)

Filecode data had been added a LUD to a sand	Description ARA
06 77 epinema 5	Writer Execution Report
07pres add mont seen 570per 70 261	Writer error messages
type to be written, one ricord 80	PRMFL for the target SDDL tables
15 The record make state of the latest state of the latest state of the latest states of the	Runtime parameter file is inserted following the \$DATA 15 card. See below for format.
the St (RSX) commande. Because 161 tem out in two roses partial data- sions the massime parameter files MICHOSEV/PS. SE' is the december runs	Between runs save file. If a temporary file is being used (e.g., a total database write), the X2R is the LUD; otherwise a PRMFL is included here.
into two sections: 'time execution An explanation of the execution	Target IDS database file. If subfiles are used they must have filecodes X1, X2, X3 assigned in sequence.
TRI standard in best rocale end app not armee units within the execution	Translator library of object

User Parameters

The user must supply run-time parameters guiding the Writer according. A summery of the user's run-time second to of the execution report. Results of one freezewa to the following rules.

of the recend to be written.

CARD 1 database-name cARD 2 first-run total/partial CARDS 3-N record-name eds mort seem bysoer to ent. - 3000 pages 701

Rules:

- 1. database-name must be a legal database name of one of the five possible databases present in the target RIF. It must correspond to the database-name supplied during IDS Analyzer execution yielding the target SDDL tables. See Section 5.6 in which the IDS Analyzer run-time parameter file was created for the target database description(s).
 - 2. first-run is either

YES in columns 1-3 indicates that this is the first Writer execution to output this database. (1) 17 97012 223 113124

As noted in Section 3.2, the writer signifies atomy or beton as

NO in columns 1-2 indicates that this is a second or subsequent run in writing this database. "NO" is only applicable for partial database writes. If NO is specified, a permanent between runs save file must be supplied on .ozzieleb Billy spinners of return filecode 160 Jugue out of persons of blooms sulky at whicher the tagged were lock in the transfer

that shows th Pickers Aug

- -month Will do 3. total/partial is either went to will told to great and been avail.
 - ALL in columns 7-9 indicates that all records for database name are to be written on this run. "ALL" cannot be specified if "NO" was used for first-run.

or

PART in columns 7-10 indicates that a partial database write is being made; the records to be written will be identified on cards 3 through n.

4. record-name is a legitimate IDS 01 record name from the target MD section. For each record type to be written, one record name per card must be supplied. The record name must start in column 1.

Example Use of Run-time Parameter File

Let Figure 9-6 be the schema for the STATES database. Because it is desired that this database be written out in two runs, partial database write is required. Figure 9-7 shows the run-time parameter files required for runs 1 and 2. The file "MICHIGAN/PPS.SF" is the between runs save file for the STATES database.

Example Output

The Writer output can be divided into two sections: the execution report and the error message report. An explanation of the execution report is provided below; error messages are summarized in Appendix E.

Writer execution is subdivided into three units within the execution

report.

INITIALIZATION (Figure 9-8)

A summary of the user's run-time parameter file is placed at the top of the execution report. Results of any previous partial database writes (not shown in Figure 9-8) are also summarized. Records to be written on the current run are listed with the following attributes.

IDS RECORD NAME - The 01 record name from the target SDDL tables of the record to be written.

IDS RECORD TYPE - IDS's record type value from 1-999 that identifies the record type.

RIF NAME - The ADBMS name that corresponds to the full IDS record name of the target RIF record.

ADDR. OF RD - Run time address of the Record Definition record of the IDS Definition Structure produced by compiling the target IDS MD section.

MASTERLESS Store (Figure 9-9)

As noted in Section 9.2, the Writer algorithm stores Masterless record types first. In Figure 9-9, the CONGRESS and STATES-IN-UNION records are the only masterless record types for the NEW-PRESIDENTIAL database. TOTAL # INSTANCES STORED is, to the best of the Writer's knowledge, the count of the number of record instances successfully stored into the target. Its value should be compared to the output of the Restructurer to determine whether instances were lost in the transfer between the target RIF database and the target IDS file. If there is a difference, it should be accounted for in the Writer error report.

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same are to be written on this run. "ALL" cannot be

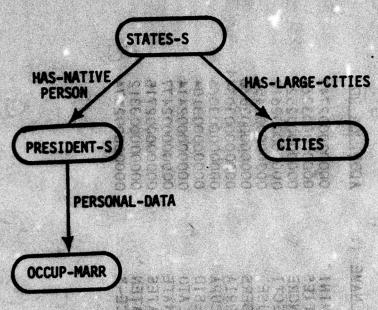


Figure 9-6
Sample Target Schema - STATES database

U	\$ DATA	USER INPUT PARAMETERS
	STATES YES PART STATES-S CITIES	Run #1
	S NOTE NOTE NOTE NOTE NOTE NOTE NOTE NOTE	- INCLUDE EITHER- S FILE 16, X2R, 2L IF ALL RECORDS ARE WRITTEN THIS RUN OR- S PRMFL 16, W, S, BETWEEN RUNS SAVE FILE IF ONLY PARTIAL DATABASE WRITE IS MADE
	S NOTE PRMFL	16.W.S.MICHIGAN/PPS'SF
П	\$ DATA	15 USER INPUT PARAMETERS
	NO PART PRESIDENT-S OCCUP-MARR	Run #2
	NOTE NOTE NOTE NOTE NOTE	- INCLUDE EITHER FILE 16, X2R, 2L IF ALL RECORDS ARE WRITTEN THIS RUN OR-
	S NOTE S NOTE	PRMFL 16, W.S. BETWEEN RUNS SAVE FILE IF ONLY PARTIAL DATABASE MRITE IS MADE
П	e PRMFL	16. N. S. MICHIGAN/PPS. SF

Figure 9-7
Run-time parameter Files for
Partial Data Write of the STATES Database

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Figure 9-10 Partial Phase 2 Writer Output

DETAIL Store (Figure 9-10)

Once all the masterless records have been stored, the Writer stores the detail records. Each detail record has attributes that are printed for informational purposes. These include:

DETAIL OF CHAIN - The IDS chain name(s) of which the record is a detail.

SET NAME - The ADBMS set name within the target RIF which corresponds to the chain name.

OWNER RECORD - The ADBMS record name which is the owner record of the SET NAME. The detail record being stored is a member of SET NAME.

- Displacement within the IDS record (in characters)
of the Chain next pointer for the chain name on
the same line.

PRIOR - Same as NXT except for the Chain prior pointer.
Zero if chain is not LINKED PRIOR.

ADDR. OF MD. - Run-time address within the .IDS.. common block of the Master Definition record for the chain on the same line of output.

As before, the user should verify that no record instances are unaccounted for between the target RIF file and the target IDS database.

Possible errors

Figure 9-11 presents an example of two Writer errors. A complete list of all Writer errors, their causes and appropriate actions is available in Appendix E.

Note: If an error occurs in a Writer execution that is serious enough to warrant rerunning the Writer, and if the following two conditions both hold, then special action is necessary:

- a). The execution of the Writer with the error was <u>not</u> the first run of a partial database write sequence.
- b) At least one instance of the erroneous record type was successfully stored into the IDS database.

The special action is simply to start all over again with the first run of the partial database write sequence (and hence, including the QUTI activity); otherwise, multiple copies of the same record instance will end up in the target database.

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User Parameters

None

Example of Output

Standard UTILITY output, hence not shown.

Possible Errors

Activity four of the Writer will turn on bit 35 of the PSW if no fatal Writer errors occurred. Otherwise, the \$IF card will cause activity five to be skipped as there is no longer a need to UTILITY copy.

one.

Any errors in activity five would be due to control card errors which unfortunately would necessitate rerunning the Writer if (and only when) the Writer run represents a partial database write other than the last.

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The purpose of validating the target database is to assure the user that the transformation specified by the TDL produced the desired results. Deviations are possible because of the presence of semantic data in the source database or possible omissions in specifying desired target groups and relations. Improper access path designation in the TDL may produce target relations as specified but cause the omission of some desired target instances.

3-01

To ensure that a transformation has been successful it is necessary to exhaustively check both relationships and instances present in the target database. Three methods are suggested for application in varying situations.

10.1 COBOL Application Programs

For databases in a medium-to-very-large range (from 20 pages up), application programs undoubtedly provide the best exhaustive check of the database and can be formatted for rapid visual verification. Programming in COBOL is the preferred method of validation if the resulting code has some recurring value in use to justify the implementation time.

In the case of a single use, however, WWDMS provides a shortcut that

is equally effective and less time consuming.

10.2 IDS Database Dumps

For small databases (less than 20 pages) a reasonable alternative to programming for verification is to use the IDS dump utility and check the database manually. Minimal knowledge of IDS storage structures and substantial patience are the only requirements.

Some valuable side effects of this method are that the database designer sees the physical result of page ranging and input ordering; the space and overhead involved with set relationships; and the physical size

of records.

10.3 WWDMS Queries

The WWDMS environment allows a user to retrieve and format information from an IDS database in a shorthand manner. Without going into the details of the query system its use allows access to any information in the database via almost any route available to a COBOL application program. 1

The user writes an Application Definition File (ADF) which specifies access paths through the database. After it has been processed with a Dictionary (the COBOL MD section) the paths may be nested to produce exhaustive dumps of the chained relations. Output formatting is as flexible

as COBOL programs in a simple command (LINE).

¹Present WWDMS-T2 does not allow the "heading" of nested chains.

For purposes of exhaustive checks it is necessary to write the ADF such that all paths emanating from a given SYSTEM entry point be nested to the point where another SYSTEM entry point is encountered. In this fashion, all instances and relationships in the database may be formatted to permit simple cross-checking of the output lists.

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in enture that a transformation has been successful it is necessify to exhaustively check buth relationships and instances present in the thrust untabase. Three methods are suggested for application in veryong situations.

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11.0 EXAMPLE TRANSLATION

This section shows by example, the steps which a user must perform for each function of the Data Translator. The example used is the restructuring of the "NEW-PRESIDENTIAL" database into a "STATES" database. Bachman diagrams for each are shown in Figure 11-1.

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2-11

The user's first step is usually augmenting her/his IDS MD section for the source database with 61 level entries. This process is described in Section 3.0. The augmented MD section for the NEW-PRESIDENTIAL database is shown in Figure 11-2. Next, the user should create an empty source SDDL database file and run the IDS Analyzer with the augmented IDS MD section as input. Setting up the JCL for the IDS Analyzer is described in Section

5.0. The JCL for this example is shown in Figure 11-3.

The user should then perform a similar set of steps for the target database. The 61 level augmented IDS MD section is shown in Figure 11-4

while Figure 11-5 is the IDS Analyzer JCL.

The next two steps, running the Reader and producing the TDL tables database, are independent processes and can be performed in any order. Example JCL for running the Reader is shown in Figure 11-6. Setting up the Reader JCL is discussed in Section 7.0. The TDL description for the translation is shown in Figure 11-7. Writing TDL descriptions is discussed in Section 4.0. The JCL to run the TDL Analyzer is shown in Figure 11-8. A description of running the TDL Analyzer can be found in Section 6.0.

The next step is to run the Restructurer. The Restructurer JCL is

shown in Figure 11-9; the JCL is discussed in Section 8.0.

The final step is to run the Writer. The Writer JCL is shown in Figure 11-10 and discussed in Section 9.0.

Files Used in Example

File name	<u>Usage</u>
MICHIGAN/NPRES. 61	Source extended MD section
/IDSA1.RS	Phase 1 IDS Analyzer R*
/TRANSLR	Translator Library
/NPRES.ST	Source SDDL tables
/SDDL.AT	SDDL tables DBTF
/INTRN.AT	Internal Work DBTF
/NPRES.PM	Run-time parameter file (IDS Analyzer source)
/IDSA2.RS	Phase 2 IDS Analyzer R*
/PPS.61	Target extended MD section
/PPS.ST	Target SDDL tables
/PPS.PM	Run-time parameter file
	(IDS Analyzer target)
/ACIDS.S1	Reader source IDS Accessor (part 1)
/ACIDS.S2	Reader source IDS Accessor (part 2)
/NPRES.MD	Source IDS MD section
/READR.RS	Reader (IDS) R*
/DRT.DB	Reader DRT database
/DRT.AT	Reader DRT DBTF
/INTERNAL	Reader internal work file

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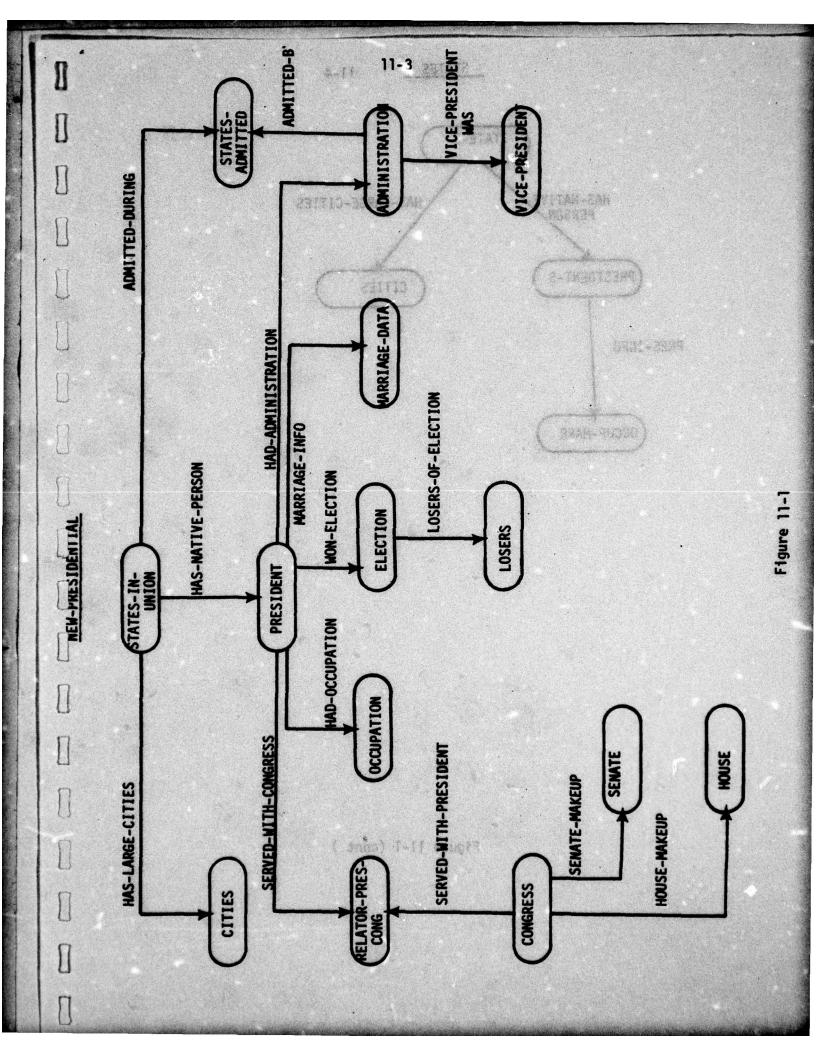
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    EXTENDED SOURCE IDS MD SECTION FOR NEW-PRESIDENTIAL
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    02 STATE-NAME
    02 YEAR-ADMITTED
                     PIC X(4)'.
   02 CAPITAL

02 AREA-SQ-MI

02 AREA-RANK

02 POPULATION

02 POPULATION

03 POPULATION

04 POPULATION

05 POPULATION

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07 POPULATION

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PIC 9(2) USAGE IS COMP-1.
    02 ELECTORAL-VOTES PIC 9(2) USAGE IS COMP-1:
   02 TRANSLATION-INFORMATION.
   61 G: STATES-IN-UNION,
   61 IsSTATE-NAME.
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      CHAIN-ORDER IS AFTER.
   HAS-LARGE-CITIES CHAIN MASTER
      CHAIN-ORDER IS SORTED.
    ADMITTED-DURING CHAIN MASTER
      CHAIN-ORDER IS AFTER'.
TYPE IS 2
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                     RETRIEVAL VIA HAS-LARGE-CITIES CHAIN'.
   02 CITY-NAME
                      PIC X(10):
   02 POPULATION-OF-CITY PIC 9(10) USAGE IS COMP-1.
   61 G: CITIES,
   92 TRANSLATION-INFORMATION SIZE O'.
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   02 FIRST-NAME
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   O2 DAY-BORN
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PIC X(4).
O2 HEIGHT
PIC X(10).
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PIC X(10).
PIC X(10).
   02 DAY-BORN
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11-6
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O2 YEAR-DIED PIC X(10).
O2 CAUSE-OF-DEATH PIC X(10).
        02 FATHERS-NAME PIC X(10).
        02 MOTHERS-NAME
02 TRANSLATION-INFORMATION.
61 P-K.
61 G: PRESIDENT,
61 I: LAST-NAME,
61 FIRST-NAME,
61 INIT:
         HAD-ADMINISTRATION CHAIN MASTER
     98
           CHAIN-ORDER IS AFTER. 714 22704-149772818 30
         WON-ELECTION CHAIN MASTER
            CHAIN-ORDER IS AFTER.
         SERVED-WITH-CONGRESS CHAIN MASTER
CHAIN-ORDER IS AFTER.
HAD-OCCUPATION CHAIN MASTER
            CHAIN-ORDER IS AFTER'. AND STATE NO STATE OF THE COMMAN
         MARRIAGE-INFO CHAIN MASTER AND ANDRESS -- VITAM- CAN
            CHAIN-ORDER IS AFTER. SATEA BE 93090-41480
         CALC CHAIN . DETAIL PRIBAM MIAMO PRINTING BURALWRAM
            RANDOMIZE ON LAST-NAME, FIRST-NAME.
         MATCH-KEY IS STATE-NAME
            SELECT UNIQUE MASTER
            LINKED TO MASTER.
************
                     TYPE IS 4
     OI OCCUPATION
                     RETRIEVAL VIA HAD-OCCUPATION CHAIN.
         02 TITLE-OF-JOB TO ASIAPIC X(10). AS A SATA BOMART SO
         02 TRANSLATION-INFORMATION SIZE O.
         61 P-K.
                                              AFITIO OF TA
         61 G: OCCUPATION.
61 I*TITLE-OF-JOB.
61 E-K-F*HAD-OCCUPATION.
         HAD-OCCUPATION CHAIN DETAILMENTS BEETING BORAL-BAN NO.
            DUPLICATES NOT ALLOWED SERVICE TOM RETAGE SAME
            SELECT CURRENT MASTER: 1000 21 YEA OAIOMSOZA
       ****************
         MARRIAGE-DATA TYPE IS 5
                          RETRIEVAL VIA MARRIAGE-INFO CHAIN'.
         02 WIVES-NAME PIC X(10).
02 MONTH-MARRIED PIC X(10).
         O2 DAY-MARRIED PIC X(10).
O2 YEAR-MARRIED PIC X(10).
O2 NUMBER-OF-CHILDREN PIC X(10).
         02 TRANSLATION-INFORMATION SIZE 0.

61 P-K.

61 G*MARRIAGE-DATA.

61 I* WIVES-NAME.

61 E-K-F*MARRIAGE-INFO.

MARRIAGE-INFO CHAIN DETAIL
```

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11.7
                DUPLICATES NOT ALLOWED
                SELECT CURRENT MASTER:
OI ADMINISTRATION TYPE IS 6

RETRIEVAL VIA CALC CHAIN

PAGE-RANGE IS 14 TO 18:
          02 ADMINISTRATION-NUMBER PIC X(3)
          O2 MONTH-INAUG PIC X(10).
O2 DAY-INAUG PIC X(2).
O2 YEAR-INAUG PIC X(4).
          02 TRANSLATION-INFORMATION'.
61 P-K.
                                                                                              CHV 14 10
                                                                              TIRKS-UNIVERSE NO. LO
                G: ADMINISTRATION,
                                                            . HOTTANSTITUT-WEST SCHAPT SO
           61 ADMINISTRATION-NUMBER.
          CALC CHAIN DETAIL
                 RANDOMIZE ON ADMINISTRATION-NUMBER.
           HAD-ADMINISTRATION CHAIN DETAIL
SELECT UNIQUE MASTER
DUPLICATES NOT ALLOWED
MATCH-KEY IS LAST-NAME, MATCH-KEY IS FIRST-NAME
                 LINKED TO MASTER
           ADMITTED-STATES CHAIN MASTER
CHAIN-ORDER IS AFTER'
           VICE-PRESIDENT-WAS CHAIN WASTER
  CHAIN-ORDER IS AFTER.
   OI STATES-ADMITTED TYPE IS 7
                                     RETRIEVAL VIA ADMITTED-STATES CHAIN.
            02 TRANSLATION-INFORMATION SIZE O.
                                                     Old COTOR-Jedutos S. Giroj
            61 G: STATES-ADMITTED. TO MAN THE STATE OF T
            61 E-K-F:
            61 ADMITTED-STATES.
            61 ADMITTED-DURING.
            ADMITTED-STATES CHAIN DETAIL
                  LINKED TO MASTER
                  DUPLICATES NOT ALLOWED SELECT CURRENT MASTER.
            ADMITTED-DURING CHAIN DETAIL
                   DUPLICATES NOT ALLOWED
                   SELECT UNIQUE MASTER
                  MATCH-KEY IS STATE-NAME:
           **************
                                         TYPE IS 8
RETRIEVAL VIA VICE-PRESIDENT-WAS CHAIN.
             VICE-PRESIDENT
                                                              PIC X(10): 13 340807 13 14
PIC X(10): 12 380807 13 14
             02 VP-FIRST-NAME
             02 VP-LAST-NAME
             02 TRANSLATION-INFORMATION SIZE O'.
             61 P-K. RESMUN-22200MID WO BEIMORNAS
             61 GIVICE-PRESIDENT, MATERIAL MARKET MARKET AND THE STANDS
             61 INP-FIRST-NAME, ARTHA OF THE MIANT
                         VP-LAST-NAME.
             61
             61 E-K-F:
                       VICE-PRESIDENT-WAS.
```

Figure 11-2 (cont.)

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11-8 GULA TAM RETAILIAND
     VICE-PRESIDENT-MAS CHAIN DETAIL
DUPLICATES NOT ALLOWED
SELECT CURRENT MASTER.
                   TYPE IS 9 1 11 NO METER TANKS SO
     ELECTION
                    RETRIEVAL VIA CALC CHAIN
     PAGE-RANGE IS 19 TO 22.

O2 YEAR-OF-ELECTION PIC X(5).

O2 WINNER PIC X(10).

O2 WINNING-PARTY PIC X(10).

O2 WINNING-ELECTORAL-VOTES PIC X(3).

O2 TRANSLATION-INFORMATION.
     02 TRANSLATION-INFORMATION.
61 P-K'.
61 G*ELECTION.
61 I*YEAR-OF-ELECTION.
CALC CHAIN DETAIL
      RANDOMIZE ON YEAR-OF-ELECTION'.
WON-ELECTION CHAIN DETAIL
SELECT UNIQUE MASTER
 98
         MATCH-KEY IS LAST-NAME, MATCH-KEY IS FIRST-NAME
         LINKED TO MASTER.
      LOSERS-OF-ELECTIONS CHAIN MASTER
         CHAIN-ORDER IS AFTER'
      **********
                  TYPE IS 10
      LOSERS
  01
                    RETRIEVAL VIA LOSERS-OF-ELECTIONS CHAIN.
      02 LOSER-NAME PIC X(10).
02 LOSER-PARTY PIC X(10).
02 LOSER-ELECTORAL-VOTES PIC X(3).
      02 TRANSLATION-INFORMATION SIZE 0.
      02 TRANSLATION
61 P-K.
61 G*LOSERS,
61 I*LOSER-NAME.
       61 LOSERS-OF-ELECTIONS'.
       LOSERS-OF-ELECTIONS CHAIN DETAIL
SELECT CURRENT MASTER
DUPLICATES NOT ALLOWED.
      ******************
                     TYPE IS 11 NESTER DELICATION TO STREET
       CONGRESS
                     RETRIEVAL VIA CALC CHAIN
                     PAGE-RANGE IS 23 TO 33'.
       02 CONGRESS-NUMBER PIC X(3):
       02 TRANSLATION-INFORMATION.
61 P-K.
61 G: CONGRESS.
61 I: CONGRESS-NUMBER.
CALC CHAIN DETAIL
       RANDOMIZE ON CONGRESS-NUMBER'.

SENATE-MAKEUP CHAIN MASTER

CHAIN-ORDER IS AFTER'.

HOUSE-MAKEUP CHAIN MASTER

CHAIN-ORDER IS AFTER'.

SERVED-MITH-PRESIDENT CHAIN MASTER
        SERVED-WITH-PRESIDENT CHAIN MASTER
```

Figure 11-2 (cont.)

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CHAIN-ORDER IS AFTER.
    SENATE TYPE IS 12
            RETRIEVAL VIA SENATE-MAKEUP CHAIN.
       02 SENATE-PARTY PIC X(10).
02 SENATORS PIC X(2).
                                        表面集任
        u2 TRANSLATION-INFORMATION SIZE O'.
        61 P-K.
        61 GJ SENATE.
        61 I: SENATE-PARTY.
        61
        61 E-K-FISENATE-MAKEUP.
        SENATE-MAKEUP CHAIN DETAIL
SELECT CURRENT MASTER
DUPLICATES NOT ALLOWED.
    *********************************
        HOUSE TYPE IS 13
        RETRIEVAL VIA HOUSE-MAKEUP CHAIN.
        02 HOUSE-PARTY PIC X(10).
02 REPRESENTATIVES PIC X(3).
       -02 TRANSLATION-INFORMATION-SIZE O.
        61 P-K.
61 G. HOUSE,
61 I. HOUSE-PARTY,
61 REPRESENTATIVES.
61 E-K-F. HOUSE-MAKEUP.
       HOUSE-MAKEUP CHAIN DETAIL
          SELECT CURRENT MASTER
DUPLICATES NOT ALLOWED:
    ***********************************
        RELATOR-PRES-CONG TYPE IS 14
     01
               RETRIEVAL VIA SERVED-WITH-CONGRESS CHAIN
               PAGE-RANGE IS 34 TO 35.
        02 TRANSLATION-INFORMATION SIZE O'.
        61 P-K.
        61 G. RELATOR-PRES-CONG,
61 E-K-F.
        61 SERVED-WITH-CONGRESS.
61 SERVED-WITH-PRESIDENT.
        SERVED-WITH-CONGRESS CHAIN DETAIL
LINKED TO MASTER
SELECT UNIQUE MASTER
          MATCH-KEY IS LAST-NAME, MATCH-KEY IS FIRST-NAME
          DUPLICATES NOT ALLOWED.
        SERVED-WITH-PRESIDENT CHAIN BETAIL
          SELECT UNIQUE MASTER
LINKED TO MASTER
         DUPLICATES NOT ALLOWED
          MATCH-KEY IS CONGRESS-NUMBER'.
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            IDENT SERVICES AND RESPONDENCE OF THE PROPERTY OF THE PROPERTY
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DI STATES-S
                       PAGE-RANGE IS 1 TO 6.
                       PIC X(10).
    UZ STATE-NAME
                       PIC X(4) .
    02 YEAR-ADMITTED
                     PIC X(10)'-
    02 CAPITAL
02 AREA-SQ-MI
                       PIC 9(8) USAGE IS COMP-1'.
                       PIC 9(2) USAGE IS COMP-1'.
   O2 AREA-RANK
O2 POPULATION
O2 POP-RANK
                      PIC 9(8) USAGE IS COMP-1'.
                      PIC 9(2) USAGE IS COMP-1'.
PIC 9(2) USAGE IS COMP-1'.
    02 ELECTORAL-VOTES
       02 ADMITTED-BY-ADMIN
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       U2 TRANSLATION-INFORMATION.
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       0.1 P-K.
    6: G: STATES-S.
6: I: STATE-NAME'.
HAS-NATIVE-PERSON CHAIN MASTER
       CHAIN-ORDER IS AFTER: BEET TRANSPORTED
    CALC CHAIN DETAIL
       C CHAIN DETAIL
RANDOMIZE ON STATE-NAME'S
    HAS-LARGE-CITIES CHAIN MASTER
                                 344%-1211W SO
       CHAIN-ORDER IS SORTED.
 CELONAM-RABY AU
                      TYPE IS 2
    CITIES
 01
                       RETRIEVAL VIA REFCODE-CITIES FIELD.
        02 REFCODE-CITIES
                        PIC X(10):
    02 CITY-NAME
    02 POPULATION-OF-CITY PIC 9(10) USAGE IS COMP-1.
        02 TRANSLATION-INFORMATION:
               TES. PRES-INFO CHAIN DETAIL.
        61 r-K.
        6.1 G: CITIES,
        of POPULATION-OF-CITY.
              HAS-LARGE-CITIES.
        61
     HAS-LARGE-CITIES CHAIN DETAIL
```

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ASCENDING KEY IS CITY-NAME
SELECT CURRENT MASTER.
        DUPLICATES NOT ALLOWED
                            TYPE IS 3
RETRIEVAL VIA REFCODE-P-S FIELD.
 01 PRESIDENT-S
          02 REFCODE-P-S PIC 9(8).
          02 REFCODE-P-S PIC 9(8).
02 RES-S-LNAME PIC X(10).
02 PRES-S-FNAME PIC X(10).
02 PRES-S-MNAME PIC X(1).
02 TRANSLATION-INFORMATION.
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G: PRESIDENT-S.
I: PRES-S-LNAME.
PRES-S-FNAME.
PRES-S-MNAME.
          ol P-K.
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 98 HAS-NATIVE-PERSON CHAIN DETAIL
 DUPLICATES NOT ALLOWED

SELECT CURRENT MASTER.

98 PRES-INFO CHAIN MASTER

CHAIN-ORDER IS AFTER.
************************************
     OCCUP-MARR TYPE IS 4
                     RETRIEVAL VIA PRES-INFO CHAIN.
     O2 TITLE-OF-JOB PIC X(10).

O2 WIVES-NAME PIC X(10):

O2 MONTH-MARRIED PIC X(10):

O2 DAY-MARRIED PIC X(10):
      UZ YEAR-MARRIED
                                PIC X(10).
      02 NUMBER-OF-CHILDREN PIC X(10):
         02 TRANSLATION-INFORMATION SIZE 0.
          61 P-K.
          6.1 G: OCCUP-MARR, NOTE
                                                BUAN-YTID SO
          6.1 I: TITLE-OF-JOB, DIS YTID-RO-ROTTALUNOS SO
6.1 MIVES-NAME OF TAKRO-ROT MOTTALBURART SO
 98 PRES-INFO CHAIN DETAIL
          SELECT CURRENT MASTER. . NMAM-YTID AI 18
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6 E-K-F1

44 HAS-LARGE-CITIES.

SE SASALARGE-CITIES CHAIN DETAIL

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IDENT
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                          ERROR MESSAGES
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             A5
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      NOTE
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                          INTERNAL WORK DATABASE
      FILE
             15.X4R
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Figure 11-6

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TARGET RECORD CITIES
    TOLAP CITI
        SOURCE RECORD STATES-IN-UNION ACCESS VIA CALC-STATES-IN-UNION
            SOURCE RECORD CITIES ACCESS VIA HAS-LARGE-CITIES
                 ACTUAL DATA IN ORDER
                 SET SIGNIFICANT DATA BY NAME
TARGET RECORD OCCUP-MARR
    TDLAP () CCU
        SOURCE RECORD PRESIDENT ACCESS VIA CALC-PRESIDENT
            FIRST-NAME ASSIGN TO PRES-S-FNAME<PRES-INFO> INIT ASSIGN TO PRES-S-MNAME<PRES-INFO>
            LAST-NAME ASSIGN TO PRES-S-LNAMESPRES-INFO>
                 SOURCE RECORD OCCUPATION ACCESS VIA HAD-OCCUPATION
                     TITLE-OF-JOB ASSIGN TO TITLE-OF-JOB
                 SOURCE RECORD MARRIAGE-DATA ACCESS VIA
                         MARRIAGE-INFO FROM PRESIDENT
                     WIVES-NAME ASSIGN TO WIVES-NAME
                     MONTH-MARRIED ASSIGN TO MONTH-MARRIED
                     DAY-MARRIED ASSIGN TO DAY-MARRIED
                     YEAR-MARRIED ASSIGN TO YEAR-MARRIED
                     NUMBER-OF-CHILDREN ASSIGN TO NUMBER-OF-CHILDREN
TARGET RECORD PRESIDENT-S
    TDLAP PRES
        SOURCE RECORD PRESIDENT ACCESS VIA CALC-PRESIDENT SET SIGNIFICANT DATA BY NAME
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    TOLAP STAT
         SOURCE RECORD STATES-IN-UNION ACCESS VIA CALC-STATES-IN-UNION
             STATE-NAME ASSIGN TO STATE-NAME
             YEAR-ADMITTED ASSIGN TO YEAR-ADMITTED
             CAPITAL ASSIGN TO CAPITAL
             AREA-SO-MI ASSIGN TO AREA-SQ-MI
             AREA-RANK ASSIGN TO AREA-RANK
             POPULATION ASSIGN TO POPULATION
             POP-RANK ASSIGN TO POP-RANK
             ELECTORAL-VOTES ASSIGN TO ELECTORAL-VOTES
         SOURCE RECORD STATES-ADMITTED ACCESS VIA ADMITTED-DURING
             ACCEPT IF NULL
                  SOURCE RECORD ADMINISTRATION ACCESS VIA
                          ADMITTED-STATES
                      ACCEPT IF NULL
                  ADMINISTRATION-NUMBER ASSIGN TO
                          ADMITTED-BY-ADMIN
                      NULL VALUE = -
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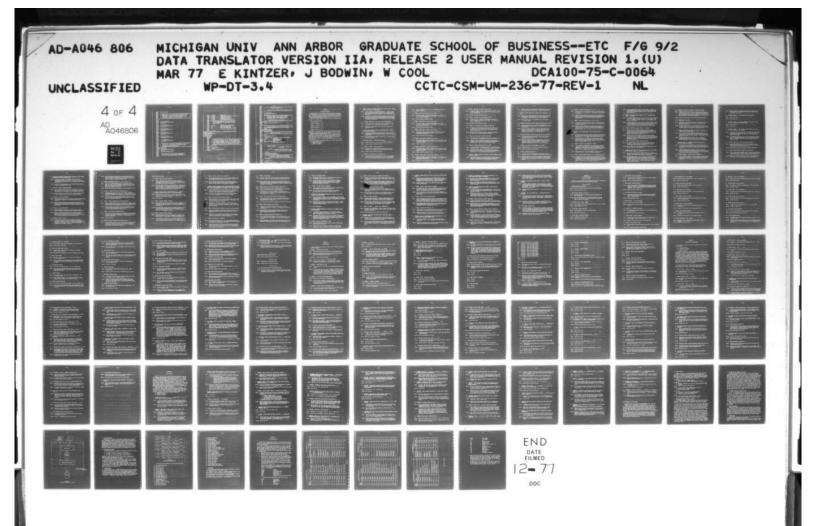
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                  TR.R.R.MICHIGAN/TRANS.LR
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                    POST PROCESS II - COMPATIBILITY BUILDED *
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MICHO, MICHIGAN
IDENT
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       * ACTIVITY OF - ALL DATABASES TO BE USED BY THE
NOTE
          RESTRUCTURER ARE COPIED FIRST TO PROTECT THE
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          ORIGINALS. BE SURE TO PUT THE CORRECT SIZES
 NOTE
          (IN RANDOM LINKS) ON THE SFILE CARDS.
 NOTE
       **************
 NOTE
UTILITY
NOTE
       01.02.RCOPY/IF/
FUTIL
       OI,R,R,MICHIGAN/NPRES.SR
PRMFL
 FILE
       02,X05,6R
 NOTE
       03,04,RCOPY/IF/
 FUTIL
       03.W.R.MICHIGAN/PPS:TR
PRMFL
       04, X.15, 3R
FILE
NOTE
       05,06,RCDPY/1F/
FUTIL
       OS.R.R.MICHIGAN/NPPS.TT
 PRIFL
 FILE
        06, X25, 3R
 NOTE
       07.08.RCOPY/1F/
07.R.R.MICHIGAN/NPPS.TT
 FUTIL
 PRMFL
        08, X35, 3R
 FILE
NOTE
        09, 10, RCOPY/IF/
FUTIL
        09.R.R.MICHIGAN/PPS.ST
10.X4S.2R
 PRMFL
 FILE
 NOTE
        11,12,RCOPY/1F/
 FUTIL
        11,R,R,MICHIGAN/WRKDB.AF
 PRMFL
 FILE
        12,X55,12R
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        **************
 NOTE
       * ACTIVITY 02 - RUN THE RESTRUCTURER. ONOTE THAT
 NOTE
          THE SLIMITS CARD MUST BE ADJUSTED FOR EACH
 NOTE
        * . PARTICULAR RESTRUCTURING JOB.
 NOTE
        ************
 NOTE
 EXECUTE DUMP.NREST
 LINITS 40.65K.-5K
        R*, R, S, MICHIGAN/RESTR'. RS
 PRMFL
 FILE
        H*..40R
        TR.R.R.MICHIGAN/TRANS.LR
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          TO THE SIX DATABASES COPIED IN ACTIVITY OF
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11-20
        IDENT
               **********
        NOTE
                         EXECUTE THE WRITER JCL
        NOTE
        NOTE
                    UTILITY COPY OF TARGET RIF INTO TEMP. FILE
        NOTE
               *********
        NOTE
        UTILITY
               A1, A2, RCOPY/IF/
        FUTIL
               AI,R.R.MICHIGAN/PRS'TR
        PRMFL
               A2.X15.2R
        FILE
               **********
        NO TE
               * IF THIS IS THE FIRST RUN ON A TARGET DATABASE, THEN INCLUDE THIS ACTIVITY.
        NOTE
        NOTE
                ELSE SKIP DOWN TO THE COMPILATION
        NOTE
        NOTE
                      INITIALIZE TARGET IDS DATABASE
        NOTE
               **********
        NOTE
         PROGRAM QUTI
               X1.REC.R.MICHIGAN/PPS.ID
                                                 二年(1)計
         PRMFL
         DATA
         INITIAL 1.12
   IDS
               ************
         NOTE
               * COMPILE THE NO SECTION INTO THE WILLER ....
         NOTE
        NOTE
               NDECK
         IDS
         SELECTA MICHIGAN/COBI'S
         SELECTA MICHIGAN/PPS.MD
       SELECTA MICHIGAN/COB2.5
               *****************
         NOTE
                     EXECUTE THE WRITER
         NOTE
               ***************
         NOTE
                                            ALL-TOLAPS-ACTIVE
         EXECUTE NREST
               R*, R, S, MICHIGAN/WRITE.RS
                                              TURKI-CHE I-CHRE
         PRMFL
               H*, HIR, 20R
         FILE
               5,50K,-2K,16000 USE APPROP. TIME & CORE REGMNTS
         LIMITS
               02,XIS TARGET RIF
        FILE
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   $ RENOTE
                                                 BIKM
               O7 ERROR REPORT
O8, W.R. MICHIGAN/PPS.ST
   $ REMOTE
              07
                                                 STOR
 S PRMFL
                                                 翌7730年
               USER INPUT PARAMETERS
         DATA
                                                 STIM
               * FILE WITH THE COURSEST INCOMES ST
                                                 27.0
   STATES
YES
         NOTE
                     INCLUDE EITHER-
         NOTE
                   $ FILE 16.X2R.2L IF ALL RECORDS ARE WRITTEN
         NOTE
                                       THIS RUN
         NOTE
         NOTE
                   * PRMFL 16, W.S. BETWEEN RUNS SAVE FILE IF ONLY PARTIAL DATABASE WRITE IS MADE
         NOTE
         NOTE
         NOTE
                16.X2R.2L
         FILE
                XI, REC, R, MICHIGAN/ PPS'. ID
         PRMFL
                TR.R.R.MICHIGAN/TRANS.LR
         PRMFL
                ***********
         NOTE
                     GO TO ENDJOB IF UNSUCCESSFUL WRITER RUN
         NOTE
                        ELSE COPY UPDATED RIF BACK TO PRMFL
         NOTE
                *************
         NOTE
                /35.ENDJOB . sees) Evil sound?
         IF
         UTIL ITY
                A1.A2.RCDPY/1F/
A1.XIR
         FUTIL
         FILE
                                         Figure 11-10
                A2. W. R. MICHIGAN/PPSTR
          PRMEL
```

S-A

IDS ANALYZER ERRORS

remarkable and reliates vetra Documentation for all IDS Analyzer errors appears in this appendix. Each error message is given a number and cross-references are sometimes made. Information concerning the fatal/nonfatal nature of the error, the activity in which the error occurs, the cause, and the action to be taken to correct each error, are given.

Almost every error message is accompanied by the following output:

Te acceptable to the uner

HARDE MORE TRAIN MERTING ARTHUR SOURCE FROM BRIEF

5. "***ERROR IN 'ADMACL' - INVALID TYRE VALUE."

Action: Contact the Data Translation Project.

6. ****ERROR...Ol RECORD-NAME NOT IN PARAMETER FILE"

***ERROR...error message text

CURRENT DATABASE IS * **** SELVIA AN ACT ME MOTTAMENT LANGUAGE ****

CURRENT 01 RECORD IS - **** & Dayathigana ash masylonA 201 ant

CURRENT 02 - FIELD IS = ****

CURRENT VALIDATION IS = ****

CURRENT 61 LEVEL IS = ****

By examining the values of the current database, record, etc. being processed, it is relatively easy for the user to examine the extended MD section to locate syntax and semantic errors.

Except for serious IDS Analyzer errors such as table overflow or exposed invalid program logic, no error is fatal to execution although occurrence of one syntax error may propagate several more. All user-correctable errors should be eliminated by appropriate modification to the extended MD section. The IDS Analyzer then should be rerun. There is no need to erase the previously built invalid SDDL tables file.

All error messages are sorted alphabetically to allow easy reference. The collating sequence observed is:

parameter. It is a fala error which occurs to activity 3.

dictionary which was not defined by the user in the descencer Fife. It is a nonfatal error which occurs in accimity 3.

Cause: An 105 Analyzer support routing has been caused an invalid

Cause: The 105 Acelyzer has encountered an Ol record in the 105 Opery

1) Numeric characters o bus forst stat where stool mangers : said

Alphabetic characters 3) Special characters special noise tenent seed soft tenent tools a 1. "WARNING: UNABLE TO GENERATE USER SUPPLIED SYS-ENTRY POINT. PROBABLE CAUSE - NAME SUPPLIED IS NON-UNIQUE."

Cause: User has attempted to override IDS Analyzer's automatic system entry relation name generator by supplying a nonunique name for the relation in a 61 level SYS-ENTRY. This a nonfatal error in activity 3.

Action: If the user still wishes to rename the relation, the relation name given in the 61 level must be changed so that it is unique.

No action is necessary if the name generated by the IDS Analyzer is acceptable to the user.

2: "***ABNORMAL TERMINATION IN IDS ANALYZER DUE TO ABOVE ERROR."

Cause: The IDS Analyzer has encountered an error from which it could not recover. This is a fatal error in activity 3.

Action: Analyze the error message directly above this and take the appropriate action.

3. "***FATAL ERROR..NON-ZERO RETURN CODE FROM ADBMS SYSTEM. CONTACT DATA TRANSLATION PROJECT."

Cause: The database management system supporting the IDS Analyzer has encountered an error in the Analyzer logic. This is a fatal error in activity 3.

**** = 21 (993) (3 783990)

-Solk tables file.

Action: The user should not attempt to find the error. Contact the Data Translation Project.

4. - "***ERROR IN 'ADHASL' - DUPLICATE DISPLACEMENTS. "Rapasson total los est

Cause: Program logic error. It is fatal and occurs in activity 3.

Action: Contact the Data Translation Project. 2983089800 1810802 (E

5. "***ERROR IN 'ADHASL' - INVALID TYPE VALUE."

Cause: An IDS Analyzer support routine has been passed an invalid parameter. It is a fatal error which occurs in activity 3.

Action: Contact the Data Translation Project.

6. "***ERROR...O1 RECORD-NAME NOT IN PARAMETER FILE"

Cause: The IDS Analyzer has encountered an Ol record in the IDS Query dictionary which was not defined by the user in the parameter file. It is a nonfatal error which occurs in activity 3.

Action: Insert the name of the OI record into the parameter file and Causer for Analyzer support routine has engonitated an error will be using its database management system, ADBMS. It is a fatal error which "***ERROR...ADBMS ERROR IN ROUTINE BLDKEY AT STMT-" An Analyzer support routine has encountered an error while Cause: using its database management system, ADBMS. It is a fatal error Action: Contact the Data Translation Project. Toggue very and na using its database menacement system, ADDMS. This farmi error "***ERROR...ADBMS ERROR IN ROUTINE BLDVIR AT STMT-" An Analyzer support routine has encountered an error while Cause: using its database management system, ADBMS. It is a fatal error which occurs in activity 4. ON SAP GROOM MET INA . SCAME ... Action: Contact the Data Translation Project. a bringry way of a record actually is an item in that record, "***ERROR...ADBMS ERROR IN ROUTINE CREVIR AT STMT-" An Analyzer support routine has encountered an error while using Cause: its database management system, ADBMS. It is a fatal error which occurs in activity 4. Action: Contact the Data Translation Project. 10. "***ERROR...ADBMS ERROR IN ROUTINE ERRPK AT STMT-" An Analyzer support routine has encountered an error while using Cause: fts database management system, ADBMS. It is a fatal error which occurs in activity 4. I notes and treent berruss above Action: Contact the Data Translation Project. 17. "****EPROR...COMMA EXPECTED AFTER WANE, NOT FOUND." ****ERROR...ADBMS ERROR IN ROUTINE INITOS AT STMT-" Cause: An Analyzer support routine has encountered an error while using its database management system, ADBMS. It is a fatal error which occurs in activity 4. Action: Contact the Data Translation Project.

12. "***ERROR...ADBMS ERROR IN ROUTINE KEYACT AT STMT-"

An Analyzer support routine has encountered an error while Cause: using its database management system, ADBMS. It is a fatal error which occurs in activity 4.

Action: Contact the Data Translation Project.

13. "***ERROR . . . ADBMS ERROR IN ROUTINE LNKEY AT STMT-" ----- TOOSIDA

Cause: An Analyzer support routine has encountered an error while using its database management system, ADBMS. It is a fatal error which occurs in activity 4.

Action: Contact the Data Translation Project.

14. "***ERROR...ADBMS ERROR IN ROUTINE PROPY AT STMT-"

Cause: An Analyzer support routine has encountered an error while using its database management system, ADBMS. This fatal error occurs in activity 4.

using its detacase nunscenent system, ADEMS. It is a fatel error

Action: Contact the Data Translation Project.

15. "***ERROR...AN ITEM RECORD HAS NO NAME ON THE INAME SET."

using its database management system, ACOMS it is a fatal error

Cause: An attempt to determine if an item specified by the user as a primary key of a record actually is an item in that record, has failed due to IDS Analyzer logic. This nonfatal error occurs in activity 3.

Action: Contact the Data Translation Project. SDDL tables generated by this run of the Analyzer should not be used.

16. "***ERROR...COLON EXPECTED AFTER NAME, NOT FOUND"

Cause: The syntax rules of the Analyzer called for a delimiting colon in a 61 level entry. This nonfatal error occurs in activity 3.

Action: Inspect the output immediately following the error message to determine at which 61 level the Analyzer was operating when the error occurred. Insert the colon in the proper place.

17. "***ERROR...COMMA EXPECTED AFTER NAME, NOT FOUND."

Cause: The syntax rules of the Analyzer called for a delimiting comma in a 61 level entry. This nonfatal error occurred in activity 3.

Action: Contact the Data Translation Project.

Action: Contact the Data Translation Project.

Action: Inspect the output immediately following the error message to determine at which 61 level the Analyzer was operating when the error occurred. Insert the comma in the proper place.

18. "***ERROR...CURRENTLY IMPOSSIBLE TO GENERATE A UNIQUE CONCAT-RELAY-NAME. CODE MUST BE MODIFIED."

Cause: The Analyzer was unable to generate a unique relation name for a contained-in-repeating group being modeled as a master/detail relation. This nonfatal error occurred during activity 3.

Action:	Change the name of the contained-in-repeating group to one whose first twelve characters are unique. Rerun the IDS Analyzer.
19. "## SEQ	*ERRORDB TYPE SPECIFIED IN PARAMETER FILE IS NOT ISP, IDS, OR
Cause:	The first line of the parameter file did not properly identify the database on which the Analyzer will work as being IDS, ISP, or Sequential. This fatal error occurred in activity 3.
Action:	Check the first line of the parameter file to insure that it is in proper format.
20. "**	+ERRORDEPENDENT KEY ITEM OF MATCH-KEY RELATION WAS NOT DEFINED.
Cause:	match-key relation does not exist. This nonfatal error occurred in activity 3.
Action:	Inspect the output immediately following the error message to determine at which 61 level the Analyzer detected the error. Make sure the dependent key item actually is an item in the dependent record and that it is spelled properly.
	*ERRORDEPENDENT SPECIFIED IN MATCH-KEY RELATION IS UNDEFINED."
Cause:	a match-key relation does not exist. This nonfatal error occurred in activity 3.
Action:	Inspect the output immediately following the error message to determine at which 61 level the Analyzer detected the error. Make sure the dependent record actually is a record in the augmented IDS MD section and that it is spelled properly.
22. ***	*ERRORDUPLICATE ITEM DISPLACEMENTS WITHIN GROUP"
Cause:	
Action:	Contact the Data Translation Project.
23. "**	*ERRORERRONEOUS DESCRIPTION."
Cause:	A 61 level has been encountered by the Analyzer which it is unable to evaluate. This nonfatal error occurred in activity 3:
Action:	Check the output following the error message to determine the 61 level which is at fault and the context in which it appears. Be certain that all the rules for coding 61 levels have been

24. "***ERROR... EXPECTED NEXT DELIMITER IS 1. ' or ';'"

Cause: The syntax rules of the Analyzer called for a delimiting period or semi-colon in a 61 level entry. This nonfatal error occurred in activity 3.

Action: Inspect the output immediately following the error message to determine at which 61 level the Analyzer was operating when the error occurred. Insert the correct delimiter as specified in Sections 3.3-3.7.

25. "***ERROR...EXPECTED NEXT DELIMITER IS ',' OR ';' OR '."

Cause: The syntax rules of the Analyzer called for a delimiting comma, semi-colon, or period in a 61 level entry. This nonfatal error occurred in activity 3.

Action: Inspect the output immediately following the error message to determine at which 61 level the Analyzer was operating when the error occurred. Insert the correct delimiter as specified in Sections 3.3-3.7.

26. "***ERROR...EXPECTING GROUP NAME TO FOLLOW KEYWORD 'GROUP'. NOT FOUND."

Cause: A 61 level entry which was to supply the Analyzer with the name of the group whose primary key(s) would be specified next, had no group name in it. This nonfatal error occurred in activity 3.

Action: Using the output which immediately follows the error message, determine which 01 record the Analyzer was processing and in which 61 level the error occurred. Insert the proper group name after the keyword "GROUP:" or "G:".

Average of the MR section and that it is spelled properly

27. "***ERROR...EXPECTING 'ITEM INFORMATION.' CLAUSE"

Cause: If a 61 level is coded beneath an item within the extended MD section, it must be OCCURS, EOG, DO-NOT-RESTRUCTURE, or ITEM-INFORMATION. The IDS Analyzer checks for ITEM-INFORMATION, hence this message will appear if one of the above clauses does not appear. This is a nonfatal error in activity 3.

Action: Refer to section 3.0 of the User Manual for correct rules on constructing level 61 entries. Rerun the IDS Analyzer.

28. "***ERROR...EXPECTING KEYWORD 'GROUP' OR 'G'. PROCESSING CONTINUES."

Cause: The preceding 61 level description alerted the Analyzer that information on a group's primary key(s) would follow in subsequent 61 levels. In this situation the Analyzer scans for the character string "GROUP" or "G". The error occurred because neither was found. This nonfatal error occurred in activity 3.

- Action: Using the output which follows the error message, determine where in the augmented IDS MD section the error occurred and make sure that the 61 level coding reflects the user's intent and follows IDS Analyzer rules.
- 29. "***ERROR...EXPECTING KEYWORD 'ITEMS' OR 'E-K-F' TO FOLLOW KEYWORD 'GROUP'. NOT FOUND."

been thoughletely entered that the SDDD tables by not attached

- Cause: The 61 level which immediately follows a 61 level description with the keyword 'GROUP' in it must contain either the keyword 'ITEMS' or 'I' or 'EXTERNAL-KEYS-FROM' or 'E-K-F'. This nonfatal error occurred in activity 3.
- Action: Using the output which follows the error message, determine where in the augmented IDS MD section the error occurred and correct the 61 level descriptions so that the Analyzer can extract the necessary information about the current group's primary key(s).
- 30. "***ERROR...EXPECTING KEYWORD 'RELATION'. NOT FOUND."
- Cause: When the user is implementing phantom pointer or match-key relations through 61 level descriptions, Analyzer syntax rules require the user to supply a unique name for this relation. The name must be preceded by the keyword 'RELATION' or 'R'. This nonfatal error occurred in activity 3.
- Action: Using the output which immediately follows the error message, determine where in the augmented IDS MD section the error occurred.

 Correct the 61 levels so that they conform to the syntax rules as described in Section 3.6.2 for phantom pointers, or Section 3.6.1 for match-key relations.
- 31. "***ERROR...EXPECTING 61 LEVEL DESCRIPTION RECORD"
- Cause: An incomplete specification of all of the required level 61s was made for either match-key or phantom pointer relations. This nonfatal error occurred in activity 3.
- Action: Refer to Section 3.3 for complete syntax for level 61s. Correct the error and rerun the IDS Analyzer.
- 32. "***ERROR...GROUP DECL'D TO HAVE KEYS ALONG RELATION IS NOT A MEMBER OF THAT RELATION. GROUP-_____ RELATION-___ "
- 'Cause: The user has coded a 61 level description which has stated that a group could get 'external-keys-from' a relation in which it is not a member. This nonfatal error occurred in activity 4.
- Action: Using the debug output in the error message, determine where in the augmented IDS MD section there appears the 61 levels that indicated this group could get external keys from the indicated relation. Check to be sure of which relation(s) the group is a detail and whether or not it actually needs external keys to identify itself uniquely.

MO DOA

33. "***ERROR...GROUP MUST BE A MEMBER OF AT LEAST ONE RELATIONproject and make some

Cause: Probably due to a previous error in executing the IDS Analyzer.

By the time activity 4 is executed, the group specified must have been incompletely entered into the SDDU tables by not attaching at least one RELAY record along the RELMEM set (see Section 5.0). This nonfatal error occurred in activity 4.

Action: Correct all errors prior to this and rerun the IDS Analyzer. a of level description with

the Paymord '6900P' in it must contain aither the Reyword (17505

34.0 "***ERROR. GROUP NOT UNIQUE" O MOST ETEN JAMESTAS TO

The Analyzer has discovered an Ol level record name in the IDS Query dictionary which is not unique. This nonfatal error occurred in activity 3. of level descriptions so that the

occurred in activity 3.

Action: The name of the Ol level record name which caused the error can be determined from the output which immediately follows the error message. Rename this 01 record and rerun the Analyzer.

"***ERROR...GROUP WHOSE FULL PRIMARY KEY CONSISTS OF SOME SET-SIG ITEMS MUST HAVE AN OWNER GROUP;- " reduire the user to supp atton. The

Cause: Error in specifying the EXTERNAL-KEYS-FROM information for the group specified. Relations used in that entry are not relations for which the group is a detail (member). This nonfatal error occurred in activity 4. letamagous est in every outpressed the error occurred

Action: Check extended MD section to ensure that all instances of EXTERNAL-KEYS-FROM entries abide by the rules of Section 3.5 of the User Manual. Correct errors and rerun the IDS Analyzer.

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Landitty (cas) conductive.

"***ERROR...GROUP-DECLARED TO HAVE KEYS FROM RELATION-DOES NOT HAVE ANY KEYS IN OWNER" was made for either match-tex

A group which had no primary keys of its own was declared in a 61 level entry to have external key(s) from a master group which also had no primary key(s). This nonfatal error occurred in activity 4.

Using the debug output information in the error message, determine which group was the source of the error and recode the 61 level entries for that group making sure that it has a valid primary key or that its owner record does.

that 37. "***ERROR...GROUP- DOESN'T HAVE ANY PRIMARY KEYS"

or occurred in activity 4. The group which is named in the error message was never indicated to have any primary keys or a source of primary keys in the 61 level coding for that group. This nonfatal error occurred in activity 4. relation. Check to be sure of which relation(s) the group is a

detail and whather or not it actually useds external keys to

Action: Find this group in the augmented MD section and recode the 61 levels making sure to use one or both of the following formats: "61 ITEMS:" or "61 E-K-F:".

The Analyzar was unable to implement a redeacter from as a

L vity tion at

38. "***ERROR...GROUP-____ HAS AN OWNER WITHOUT A PRIM. KEY"

Cause: Same as error #37.

Action: Same as error #37. notices of beingspus ads of bepared

39. "***ERROR...GROUP- MUST BE A MEMBER OF SOME RELATION. CAUSE
DUE TO USER OR PREVIOUS ICS ANALYZER ERROR.

Cause: At See error #33. Since rather as my safe nationing and but

Action: See error #33.

40. "***ERROR...GROUP- WAS DECLARED TO HAVE EXTERNAL KEYS ALONG-BUT IS NOT A MEMBER OF THIS RELATION"

Action: From the output which follows the error message, determine which

Cause: A 61 level "E-K-F:" description for the group named in the error message supplied the Analyzer with the erroneous information that the group was a member of the named set. This nonfatal error occurred in activity 4.

Action: From the debug output contained in the error message, determine where in the augmented MD section the invalid 61 level description occurred. Be sure to supply only relation names of which this group is a member.

41. "***ERROR...IDENT CAN'T BE SPECIFIED FOR IDS DATABASES."

Cause: The user has inadvertently used a 61 level description, "61 IDENT", which can be used only for ISP or sequential databases. This nonfatal error occurred in activity 3.

Action: Remove the 61 level which contains the "IDENT" description.

42. "***ERROR...IDENTIFICATION FOR RECORD TYPE NOT DEFINED"

Cause: For ISP and sequential databases, each 01 record must contain one item, denoted by the 61 IDENT: clause to be the record identifier. If this is not done, this nonfatal error occurs in activity 3.

monfetal error occurred in activity 3.

Action: Define record identifiers using the rules of Section 3.7 of the User Manual via the 61 IDENT entry and rerun the IDS Analyzer.

43. "***ERROR...IDS ANALYZER GENERATED NAME (ITEM-NAME/IT) IS NOT UNIQUE, CHANGE NAME IN MD AND 61 LEVEL SECTIONS TO THE PROPERTY OF THE 1-X-3 18" no ":2M3X1 1A"

Cause: The Analyzer was unable to implement a repeating item as a concatenated relation because it could not assign unique names to the group and the item within it. This nonfatal error occurred in activity 3. Same as error 437.

Action: As the error message suggests, the repeating item's name must be changed in the augmented MD section.

44. "***ERROR...ILLEGAL OR MISSING DELIMITER" DUE TO USER ON PREVIOUS

While parsing a 61 level description, the Analyzer was unable to Cause: find the delimiter that syntax rules would require given this 61 level description. This nonfatal error occurred in activity 3.

BUT IS NOT A MEMBER OF THIS RELATION"

Action: From the output which follows the error message, determine which 61 level caused the error and insert the proper delimiter.

45. "***ERROR...ILLEGAL PAD CHARACTER"

LAKED TO HAVE SATERWAL KETS ALCOHO-

A 61 level "E-K-F:" description for the group named in the error Cause: The Analyzer was unable to find the new user-specified pad character in the 61 level description. This nonfatal error occurred in activity 3. occurred in activity

Action: From the output following the error message, determine which 61 level description containing the keyword 'PAD: caused the error. Be sure that a new pad character is supplied following IDS Analyzer syntax rules.

"***ERROR....ILLEGAL SECTION NAME" DATE BE T MAD TWODI. ... ADRRES***

Cause: The Analyzer has encountered a 61 level description which it does not recognize. This nonfatal error occurred in activity 3.

nonfatal error occurred Action: Using the output which follows the error message, determine in which area of the augmented MD section the error occurred. Check to see that all the 61 levels in that area have valid syntax and are logically consistent with the Analyzer rules.

47., "***ERROR...ILLEGAL SYS-ENTRY" seeded to lettreupte bed 921 103 192150

item, demonst by the 61 IDEMT: clause to be the record identifier Cause: An attempt to override the Analyzer's default system-owned relation name generator with the "SYS-ENTRY:" 61 level description has failed. The reason is either: 1) "SYS-ENTRY" syntax was violated; or 2) the record is not on a CALC or primary chain. This nonfatal error occurred in activity 3.

Action: Using the output which immediately follows the error message, determine which 61 level description was the source of the error. Check to see that all syntax rules were followed and that the record is a member of a CALC or primary chain.

48. ***ERROR ... IMPOSSIBLE TO OPEN DB-____ RM-_SO__IERR-_A____

Cause: One of the two ADBMS databases used by the Analyzer cannot be opened for access. This is probably a control card error; databases must be random, the size must be at least 1 link. This fatal error occurred in activity 3.

Action: Contact the Data Translation Project if control cards are correct.

49. "***ERROR... IN MATCH-KEY RELATIONS, EXPECTING WORD-'KEY'"

Cause: The Analyzer has detected a syntax error while processing 61 levels describing a match-key relation. The next 61 level should have been: "61 KEYS:". This nonfatal error occurred in activity 3.

Action: Using the output following the error message, determine at which 61 level the Analyzer detected the error and insert the 61 level coding as described in Section 3.6.1.

50. "***ERROR...INVALID DEPENDENT NAME FOR PHANTOM RELATION"

Cause: While processing 61 level entries which describe a phantom pointer relation, the Analyzer was unable to find the name of the dependent in the relation. This nonfatal error occurred in activity 3.

Action: Using the output following the error message, determine at which 61 level the Analyzer detected the error and insert the proper 61 level coding as described in Section 3.6.2.

51. "***ERROR...INVALID NAME FOR PHANTOM RELATION."

Cause: While processing 61 level entries which describe a phantom pointer relation, the Analyzer was unable to find the name of the relation following the 61 level: "61 RELATION:". This nonfatal error occurred in activity 3.

Action: Using the output following the error message, determine at earth of level the error occurred and insert the correct of level

Action: Same as error #50.

52. "***ERROR...INVALID POINTER NAME FOR PHANTOM RELATION"

Cause: While processing 61 level entries which describe a phantom pointer relation, the Analyzer was unable to find the name of the item to be used as a pointer following the 61 level: "61 POINTER:".

This nonfatal error occurred in activity 3.

Action: Same as error #50, for vieterbound noise tugues on gard antica

Check to see that all syntax rules were followed and that th "***ERROR...INVALID 61 LEVEL DESCRIPTION." Today & at bridge

a control card errer

Cause: While processing 61 level descriptions which followed "02 TRANSLATION INFORMATION SIZE O", the Analyzer encountered a 61 level which is not correct given the context in which it appears. This nonfatal error occurs in activity 3.

determine which di level description was the source of the error.

agende for secess Action: Using the output following it, determine which 61 level generated the error message. It is possible that the error was initiated by the 61 level coding immediately preceding the current 61 level. Therefore, make sure that the last few 61 levels reflect the user's intent and follow Analyzer syntax rules.

49. ****SRROR...IN MATCH-KET RELATIONS. ERPERTING WORDSTKEY!*

54. "***ERROR...ITEM WITH DBKEY (SEE DUMP REPORT) OF- DECL'D TO BE PRIMARY KEY MORE THAN ONCE MULTIPLE DECLARATIONS IGNORED" evels describled a match-key relation. The next Of level should

Cause: The user has specified an item as a primary key of a record more than once in the 61 level description, "61 PRIMARY-KEYS:". This nonfatal error occurred in activity 4. of level the Amelyzon detected the error and insert the 61 level

Action: None necessary. . . 1.8.8 nothank of bedradesh as purbon

55. "***ERROR....KEYWORD 'DEPENDENT' EXPECTED"

Cause: While processing 61 levels describing match-key or phantom pointer relations, the Analyzer expected the 61 level "61 DEPENDENT:" to appear next but did not find it. This nonfatal error occurred in activity 3.

Action: Uning the output tollowing the error message, determine at odnit Action: Using the output following the error message, determine at which 61 level the error occurred and insert the correct 61 level description as described in Section 3.6.2 for phantom pointers, or Section 3.6.1 for match-key relations. " HOLLATES BOTHLIN HAME FOR HILLION SELATION."

56.4 "***ERROR. . . KEYWORD ! PARENT' NOT FOUND" ! fa garageorg sitting

relation, the Analyzor was unably to find the name of the relatio Cause: While processing 61 levels describing match-key relations, the Analyzer expected the 61 level "61 PARENT:" to appear next but did not find it. This nonfatal error occurred in activity 3.

Action: Using the output following the error message, determine at which 61 level the error occurred and insert the correct 61 level description as described in Section 3.6.1 for match-key relations.

Cause: While processing Sileyel entries which describe a meanton pointer

relation, the Analyzer was unable to first the name of the item to on used as a pointer full owing the Si keyel: "18 POINTER".

a This monistal error occurred in activity 3.

CHREST

- 57. "***ERROR...LENGTH OF NAME OVER 30 CHARACTERS"
- Cause: The user has specified a group, item, or relation name which is greater than 30 characters long in the augmented IDS MD section.

 This nonfatal error occurred in activity 3.
- Action: Using the output which follows the error message, determine where in the MD section the error occurred and change the name to one less than or equal to 30 characters in length.
 - 58. "***ERROR...LOOPS OF PRIMARY KEYS MUST HAVE BEEN DEFINED BY THE USER. CHECK TO SEE THAT PRIMARY KEYS FOR ANY GROUP AREN'T MADE UP OF PRIMARY KEYS THAT THE GROUP GENERATES TO ITS MEMBERS. APPLY THIS RECURSIVELY."
 - Cause: A basic IDS Analyzer rule has been violated. A circular path, describing where groups get primary keys has been defined in the 61 levels. This nonfatal error occurred in activity 4.
 - Action: Refer to the debugging report which follows the error message.
 61 levels which propagated the error must be recoded.
 - 59. "***ERROR...MATCH-KEY ITEM NOT DEFINED IN PARENT"
 - Cause: The item specified by the user as a match-key item in the parent of the relation is not an item which appears in the parent. This nonfatal error occurred in activity 3.
 - tion: Recode the 61 level entry "61 KEYS:", so that the key item specified is a valid item within the parent. The 61 level which caused the error can be determined from the output which follows the error message.
 - 60. "***ERROR...PHANTOM RELATIONS CANNOT BE USED FOR ISP OR SEQ DATABASES"
 - Cause: The user has attempted to implement a phantom pointer relation in an ISP or sequential database. This nonfatal error occurred in activity 3.
 - Action: Because this is prohibited by the IDS Analyzer, the user should remove the 61 level coding relevant to the error and implement the desired relationship in another acceptable way.
 - afdent any resultant satt with resemble of the end of the resident as the second of the resident of the second of
 - Cause: The Analyzer has detected a 61 level 'END OF GROUP' description which is out of context based on the preceding 61 level descriptions. This nonfatal error occurred in activity 3.
 - Action: Inspect the output which follows the error message to determine which 61 level contains the misplaced EOG.if it is extraneous, or rewrite the 61 level descriptions to follow IDS Analyzer syntax rules as described in Section 3.3.

62. "***ERROR...MISSING PRIME"AND OF MENO SMAN TO HTGHEL. . PORTE ***

Cause: Correct 61 level syntax in this situation caused the Analyzer to look for a prime (1). This nonfatal error occurred in activity 3.

Action: From the output which follows the error message and the intent of the user in coding it, determine which 61 level caused the error. Refer to the syntax rules covering this situation to determine where the prime is to be placed.

63. "***ERROR... MORE THAN 5 DATA BASES ENTERED IN PARAM. FILE."

Cause: The user specified more than five database names in the parameter file. This nonfatal error occurred in activity 3.

Action: The IDS Analyzer restricts the number of databases on which it will work to five. In order to use the Analyzer module, the user should observe this limitation.

64. "***ERROR...NAME IN CLAUSE MUST BEGIN WITH LETTER OR DIGIT"

Cause: User name must begin with a letter. Constants must begin and consist entirely of digits. Violation results in this nonfatal error which occurs in activity 3.

65. "***ERROR...NAME OF RELATION IS NOT UNIQUE"

Cause: The name of the relation supplied by the user to be used in a match-key relation is not unique. This nonfatal error occurred in activity 3.

Action: Using the output following the error message, determine the location of the 61 level containing the non-unique relation name. Change the relation name.

66. "***ERROR...NO DATA BASES SPECIFIED IN PARAM. FILE"

Cause: After reading the entire parameter file, the Analyzer was unable to find the name of any database. This fatal error occurred in activity 3.

Action: Check the parameter file to be sure that the name of the user's database is specified according to the rules stated in Section 5.6.

Action: Inspect the output which follows the error message to determine worldn 6) larer contents the utsplaced 256.1f it is extracedes, or rewrite the 61 lavel descriptions to follow 105 Analyzer syntax

calles as described in Section 3.3.

67. "***ERROR. ... NO DELINITER FOUND" A TEN HOTER OF THIS A. HOTER STATE OF

Cause: The Analyzer expected to find a legal delimiter but could not.
This nonfatal error occurred in activity 3.

Action: Inspect the output following the error message to determine in which 61 level the Analyzer expected to find a delimiter.

Hake sure the syntax is consistent with the user's intent and the IDS Analyzer syntax rules.

68. "***ERROR...NO GROUPS DEFINED IN DATABASE"

Cause: The IDS Analyzer failed to generate any groups in the SDDL tables. This nonfatal error occurred in activity 4.

Action: Using the output which tollows the error message, determine which

in accordance with the rules set forth to Section 3.6.1.

Action: This error will not occur without other errors preceding it. Correcting these errors should eliminate this one.

69. "***ERROR...NO ITEM RECORDS ARE PRESENT ON THE ITEM SET IN THE SDDL TABLES FOR THE CURRENT GROUP"

Cause: While attempting to determine if an item specified by the user as a key of a group is actually an item within that group, the Analyzer discovered that the group has no items. This nonfatal error occurred in activity 3.

Action: This error can occur only as a result of prior errors. If, after correcting all prior errors, this message still appears, contact the Data Translation Project.

70. No longer implemented a sugar reason and raise. Indeed the

71. "***ERROR...NUMBER OF MATCH-KEYS IN PARENT NOT = TO NUMBER OF MATCH-KEYS IN DEPENDENT"

Cause: In defining a match-key relation in the 61 levels, the user mismatched the number of match-keys in the parent and the dependent. This nonfatal error occurred in activity 3.

Action: Determine where the match-key relation is defined in the augmented MD section by examining the output following the error message. Change the 61 level coding so that the numbers of match-keys in the parent and the dependent are equal.

This nonfatal error occurred in activity 3.

72. "***ERROR...NUMBER OF OCCURRENCES IS ZERO"

Cause: User specified OCCURS O TIMES in level 61 entry. This nonfatal error occurred in activity 3.

Action: Groups must occur at least once. Rewrite the level 61 entry according to rules in Section 3.3 and rerun the IDS Analyzer.

"***ERROR...PARENT OF MATCH-KEY RELATION IS NOT DEFINED"

Cause: The name of the group which the user specified as the parent in a match-key relation does not exist. This nonfatal error occurred in activity 3. Action: Inspect the output folighted the error

Action: Using the output following the error message, determine where the Analyzer was in the augmented IDS MD Section when the error was detected. Replace the name of the parent group with a valid one "dance with the rules set forth in Section 3.6.1.

NTOM RELATION NAME NOT UNIQUE"

The name of the phantom relation supplied by the user is not Carise: unique to this augmented MD section. This nonfatal error occurred in activity 3. Correction these errors should abuningte

68. ****ERFOR...NO GROUPS DEFENED IN DATABASE

TABLES FOR THE CORREST GROUPS

Causes

Action: Using the output which follows the error message, determine which 61 level contains the nonunique relation name and change it.

75. "***ERROR...'POINTER' NOT FOUND" Cause: While attempting to determine

Cause: The syntax rules for coding 61 levels to define phantom pointer relations require the key word 'POINTER' which the Analyzer was unable to find. This nonfatal error occurred in activity 3.

Action: Using the output which follows the error message, determine where in the MD section the phantom pointer relation was defined. Make sure that the syntax rules of Section 3.6.2 are obeyed.

76. "***ERROR...RELATION-____ DOESN'T HAVE A MEMBER GROUP" "SOLUTION-____

Previous error in IDS Analyzer. Detail (member) of either a chain, Cause: match-key, or phantom relation does not exist. This nonfatal error occurred in activity 4.

Action: Correct all previous errors and rerun IDS Analyzer.

dent This nonfaces error occurred in austritus 77. "***ERROR...SIZE CONFLICT BETWEEN LENGTH OF GROUP AND LENGTHS OF ELEMENTARY ITEMS" with section by examining the output following

Cause: A group of size "x" has been defined in the IDS MD section, but the sum of its elementary items is not equal to its declared size. This nonfatal error occurred in activity 3.

Using the output which follows the error message, determine where Action: in the augmented IDS MD section the error occurred. Following the rules set forth in Section 3.2.1, recalculate the length of the group.

received to release in Special 3 3 and every one of anthropasses

Act on: Groups must accur of least once. Rowrite she level to entry

- 78. "***ERROR...SYMBOL DEFINED IN 61 LEVELS IS NOT IN THE IDS MD SECTION, SYMBOL IS: "
- Cause: The user specified a match-key item, phantom pointer item, or dependent group name within level 61 entries for which there is no occurrence within the IDS MD section. The most likely cause is misspelling. This nonfatal error occurred in activity 3.
- Action: Correct erroneous level 61 entry where the "symbol" appears and rerun the IDS Analyzer.
- 79. "***ERROR...SYNTAX OF IDENT CLAUSE IS INCORRECT"
- Cause: The Analyzer was unable to successfully parse through the 61 level description being used to define an IDENT item for the current record. This nonfatal error occurred in activity 3.
- Action: Using the output which follows the error message, determine at which 61 level the error occurred and rewrite it to follow correct syntax rules.

Project if the another occurred in a source 45 spector. Otherwise

- 80. "***ERROR...THERE IS NO NEXT POINTER FOR MD"
- Cause: Query dictionary was incorrectly built by IDS Translator in query mode. Each Master Definition record has a field within it containing the displacement of the next pointer for the chain. If this field is zero, the above nonfatal error occurs in activity 3.
- Action: Check extended IDS MD section closely to ensure that all 98 chain CHAIN MASTER entries are correctly written. Refer to the IDS Programmer's Guide for complete syntax rules.

roles stated in Saction 3.5.

- 81. "***ERROR...TOO MANY 02 LEVELS MAX = 50"
- Cause: Internal tables in the IDS Analyzer can handle only 50 02 levels per 01 record. This fatal error occurred in activity 2.
- Action: Change the MD section to have fewer than 50 02 levels if it is a target MD; otherwise, contact the Data Translation Project.

Action: Determine from the entract of the season some animals.

- 82. "***ERROR...UNABLE TO SET CURRENCY OF HASPK AND EXKEYS SETS. NO GRP RECORD TO MATCH USER SUPPLIED GROUP NAME."
- Cause: This error can occur only as a result of previous errors or program logic faults. It is a nonfatal error which occurs in activity 3.
- Action: If, after all previous errors have been corrected, this error still remains, contact the Data Translation Project.

83. "***ERROR...USER CODED MULTIPLE TRANSLATION INFORMATION'S. 61
LEVELS IGNORED EXCEPT UNDER 1ST OCCURRENCE"

Cause: The 02 level, "02 TRANSLATION-INFORMATION SIZE 0" has occurred more than once under the same 01 record. This nonfatal error occurs in activity 3.

Action: Remove the redundant "02 TRANSLATION-INFORMATION SIZE 0". Its location can be determined by examining the output which follows the error message.

84. "***ERROR...USER DEFINED MORE THAN 75 GROUPS, VECTORS FOR BLDKY MUST BE REDIMENSIONED."

Cause: An internal Analyzer table overflowed because the user specified more than 75 groups in the augmented MD section. This fatal error occurred in activity 4.

Action: Although this error will not terminate execution, it probably will propagate further errors. Contact the Data Translation Project if the problem occurred in a source MD section. Otherwise, reduce the MD to less than 75 groups, if possible.

85. "***ERROR...USER HAS SPECIFIED AN INVALID GROUP NAME."

Cause: The name of the group supplied by the user in the "Primary-Keys" section does not exist. This nonfatal error occurred in activity 3.

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Action: Determine which 61 level description contained the invalid group name by inspecting the output which follows the error message. Replace the incorrect name with one which is consistent with the rules stated in Section 3.5.

86. "***ERROR...USER HAS SPECIFIED AN INVALID ITEM AS A PRIMARY KEY"

Cause: The item named by the user to be a primary key of a group is not an item belonging to that group. This nonfatal error occurred in activity 3.

Action: Determine from the output which follows the error message which 61 level description contains the source of the error. Delete the invalid item's name and make sure that all other items declared as keys for the group actually are items within that group.

This error can occur only as a result of previous errors or

87. "***ERROR... USER SYNTAX IS WRONG"

Cause: The Analyzer is unable to interpret the current 61 level given the context in which it appears. This nonfatal error occurred in activity 3.

- Action: Determine from the output that follows the error message which 61 level generated the error message and check that 61 level, as well as several others before it, to make sure that all relevent syntax rules are obeyed.
- 88. "***ERROR...*****DATABASE FOR SDDL TABLES IS TOO SMALL, ACTIVITY TERMINATED."
- Cause: This error message is preceded by error message #9. The error occurred because the Analyzer's supporting database management system, ADBMS, has run out of room in the database which holds the SDDL tables. This is ADBMS error #17. It is a fatal error which occurred in activity 4.
- Action: Recreate the SDDL tables database to a larger size and rerun the Analyzer.
- 89. "***WARNING...SET-SIG ITEM NAME FOR-____ TRUNCATED ON RIGHT TO 240 CHARS"
- Cause: A set-significant item name was generated with a length greater than 240 characters, the upper limit allowed. Truncation occurred to trim it to 240 characters. This nonfatal error occurred in activity 4.
- Action: No action is necessary. This message is generated simply to alert the user to the fact that some set-significant item names may have an unusual appearance due to the truncation.
- 90. "******ERROR IN NAMEXS******

I

- Cause: An Analyzer support routine was unable to generate a needed name. The user specified more than twenty items within one record whose first six characters are identical or there are more than twenty! record or relations whose names have identical first six characters. This nonfatal error occurred in activities 3 and 4.
- Action: Change user names so that first six characters of records, relations, and items are not identical.

TOL ANALYZER ERRORS

5-3

Activity 1 Errors

Activity 1 is an execution of the system UTILITY routines. A description of the errors generated can be found in the UTILITY manual.

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Actions Correct the matte delivered syntax error

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Activity 2 Errors and RECEIVE SUBTREME A

1. ANALYZER ERROR, STACK OVERFLOW

evolutions viscovery projecture

Cause: The error recovery procedure was not able to recover properly.

Action: Correct any previous errors. The restrict and reverses the Line Line

2. MACRO LITERAL TRUNCATED TO ONE LINE TO BUILDINGS MACRO MACRO MACRO TRUNCATED TO ONE LINE TO BUILDINGS MACRO MAC

Cause: The literal portion of a macro declaration exceeded one line.

This is a warning.

Action: Make sure that the macro literal begins and ends on the same

line. If the macro literal is more than one line long, then

several literals may be needed.

3. MACRO-NAME INSIDE OF MACRO, IGNORED A 101 odd ni norma (826) A 1820-3

Cause: A macro name was found inside the macro literal. This is a warning.

Cause? The macro same is missing in the macro definition. This is a municial

Scolence Macong File the TDL Analyzer with a larger 91,00% DATA.

Action: Remove imbedded macro names.

4. SYNTAX ERROR, ILLEGAL TOKEN PAIR MAN HERU BA GERETRE . M.A JAPELLE OF

Cause: A user syntax error. This is a nonfatal error.

Action: Remove the syntax error.

5. SYNTAX ERROR, NO PRODUCTION MATCHES TRANSPORTED TO THE TRANSPORT OF THE

Cause: A nonfatal user syntax error.

Action: Remove the syntax error.

6. ERROR RECOVERY PROCEDURE BEGINNING

Cause: A previous syntax error has caused the error recovery procedure

of the errors generated can be found in the UTILITY manual

several like ale was do named

to begin. This is a warning.

Action: Remove the previous syntax error.

7. ERROR RECOVERY PROCEDURE COMPLETED

Cause: A previous syntax error initiated the error recovery procedure which is now complete. Lines between the "beginning" and the "completed" error recovery procedure warning messages were not processed. This is a warning.

Action: Remove the previous syntax error. Darra Qualvana van 1000000 control

8. EOF FOUND, SECTION COMPILING STOPPED THE STANDARY JANSTILL ORDAN

Cause: A previous syntax error initiated the error recovery procedure which could not recover before the end-of-file was reached. This is a nonfatal error.

Action: Remove the previous error.

9. ANALYZER ERROR, R-W TABLE OVERFLOWED

Cause: A fatal error in the TDL Analyzer.

Action: Ensure that the TDL parse tables are connected to the correct I/O unit.

10. ILLEGAL R.W. - ENTERED AS USER NAME THE MAKE A PORTS MATHER A

Cause: This nonfatal error should appear only in future implementations of the TDL Analyzer.

Action: Contact the Data Translation Project.

11. ANALYZER ERROR, SYM TABLE OVERFLOW MOZTOUDDRY ON RORES CATHYZ .

Cause: Too many user names and macros were entered; the symbol table has overflowed. This is a fatal error.

Action: Recompile the TDL Analyzer with a larger BLOCK DATA.

12. MACRO MUST BE FOLLOWED BY A NAME

Cause: The macro name is missing in the macro definition. This is a nonfatal error.

Action: Correct the macro definition syntax error.

13. NAME PREVIOUSLY USED - MACRO IGNORED TO THE PROPERTY OF TH

Cause: The macro name was previously used. This is a nonfatal error.

Action: Change toe peer mage:

Action: Change the integer.

Action Chance the Titeral

Action: Correct the switch.

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f buse for some to the desired A result

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in correct.

Action: Select a new macro name.

14. LITERALLY SHOULD FOLLON MACRO-NAME

Cause: Improper macro definition syntax. This is a warning.

Action: Correct the syntax error.

Cause: Improper macro definition syntax. This is a nonfatal error.

Action: Correct the syntax error.

16. SEVERE ERROR(S), MACRO NOT ENTERED AND A HITTMAN THE MACRO MARKET AND AND ARREST ARREST AND ARREST AND ARREST AND ARREST AND ARREST AND ARREST AND ARREST AR

Cause: Previous errors have caused the macro definition to be ignored.

This is a nonfatal error.

Action: Correct the previous errors.

17. ANALYZER ERROR, FREE AREA OVERFLOWED

Cause: Too many user names and macro names were entered. This is a

fatal error.

Action: Recompile the TDL Analyzer with a larger block data.

18. ANALYZER ERROR. FREWRD OVERFLOWED

Cause: Too many user names and macro names were entered. This is a

fatal error.

Action: Recompile the TDL Analyzer with a larger block data.

19. ILLEGAL CHARACTERS IN INPUT, IGNORED

Cause: Illegal characters appeared in the input stream. This is a

Course: The terdet recent with the specific name does not exist

est brooms Jeaned end deld expans to

solds warning. and hi be

Action: Remove the illegal characters.

Cause: The user name is more than 256 characters long. This is a warming.

Action: Change the user name.

21. INTEGER OVERFLOW, VALUE TRUNCATION AND AND AND ADDRESS OF THE PROPERTY OF

The integer has exceeded its maximum value. This is a warning.

Action: Correct the syntax error.

Action: Correct the typical error.

Action: Correct the previous errors:

TA. ANALYZEN CROAR, FREE AUGU A

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Causa

into its a municipal error.

Actions Recomplie the TD Analyzer with a larger

Action: Change the integer.

22. LITERAL LENGTH > 256, WAS TRUNCATED AND THE REGION OF THE PARTY AND THE PARTY AND

Cause: The literal is more than 256 characters long. This is a warning.

Action: Change the literal.

Cause: The closing prime for the literal is missing. This is a warning.

Action: Correct the syntax.

24. COMMENT DOES NOT TERMINATE WITH A */

A comment was not enclosed by /* and */. This is a warning. Cause:

Cause: Too many user names and macro causes were do Action: Correct the syntax error.

EOF MISSING, EOF CARD INSERTED

Cause: The last card processed was not an EOF card. This is a warning.

Action: Insert an EOF card after the last card.

26. TARGET RECORD NOT FOUND AND A STANDARD AND A ST

The target record with the specific name does not exist. This is Cause: TO INLEGAL CHARACTERS IN IMPUT, IGHTORY

a nonfatal error.

Action: Check the target SDDL table dump (part of the IDS Analyzer output)

to ensure that the target record name used in the TDL description Action: Memory the filenel characters.

is correct.

27. TOLAP NAME TRUNCATED TO 12 CHARACTERS

Cause: A TDLAP name is longer than 12 characters. This is a warning.

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the "fram" source receive has not

seration to be been yes

Action (Act the correct Late name

Actions Correct the Miss name.

remain)

coly to actual thems.

Action: Select a shorter TDLAP name.

28. TARGET ITEM ASSIGNED MORE THAN ONCE

A target item has been assigned more than once in the same

TDLAP. This is a warning.

Action: Determine which assignments, if any, are erroneous and remove them.

Action: Alter the TDLAF so that all actions and qualifications sets

29. TARGET ITEM NOT FOUND

The target item does not exist in the specified target record. Cause:

This is a nonfatal error.

Action: Check the target SDDL table dump (part of the IDS Analyzer output)

to ensure that the target item name used in the TDL description

is correct.

30. SOURCE RECORD NOT FOUND

The source record does not exist. This is a nonfatal error. Cause:

Action: Check the source SDDL table dump (part of the IDS Analyzer

output) to ensure that the source record name used in the TDL

Action: Check the source record and 12 to determine which is to error;

description is correct.

31. ID BUFFER OVERFLOW

More than 50 ID names were specified on a single TDLAP. This

is a nonfatal error.

Action: Remove unneeded ID names. If more than 50 ID names are needed.

recompile the TDL Analyzer with a larger block data. some bropper appropriately and that the "front source record was

32. ACCESS VIA RELATION NOT FOUND

Cause: The access via relation does not exist. This is a nonfatal error.

Check the source SDDL table dump (part of the IDS Analyzer output)

to ensure that the access via relation name in the TDL description

is correct.

33. SET SIG ITEMS CANNOT BE ASSIGNED ST OF GREEK WORT SHARE THE TO

Cause: A source set-significant item was used in a TDLAP where ACCEPT IF NULL was specified for one or more of the source records. This is a nonfatal error.

Action: Alter the TDLAP so that all assignments and qualifications refer only to actual items.

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34. SOURCE ITEM NOT FOUND TO THE BEAUTY AND THE STATE AND

Cause: The source item does not exist in the specified source record.

This is a nonfatal error.

Action: Check the source SDDL table dump (part of the IDS Analyzer output) to ensure that the source item name in the TDL description is correct.

35. QUALIFICATION LINK NAME TRUNCATED

Cause: The qualification link name is more than six characters long. This is a nonfatal error.

Action: Correct the link name.

36. INVALID ID FOR RECORD

Cause: The specified ID does not match the record given. This is a nonfatal error.

Action: Check the source record and ID to determine which is in error.

37. FROM SOURCE RECORD NOT FOUND

Cause: The "from" source record has not yet been placed on the access tree (TDLAP). This is a nonfatal error.

Action: Check to see that the correct record name and relation name were used. Then make sure that the "from" source record was previously placed on the DTLAP. The ordering of source records may need to be altered.

38. CONVERSION LINK NAME TRUNCATED AND HOLDER ATT THE SELECT

Cause: The conversion link name is more than 6 characters long. This is a nonfatal error.

Action: Use the correct link name.

45. NO WORK TO ATTACH SCHOOL RECH

TO PERCONAL MAD MAN SO RESPONDED TO

AZ. PMODE ALMEAGY EXISTS ON ACCESS TREE

A source mecand has

Action: Geterrine which courses

Cause: Owner Indiane was easier fied what men

39. NULL VAL ILLEGAL W/O ACCEPT IF NULL

A null value was specified for a target item and Reject IF NULL Cause:

was specified (or defaulted) for the source record.

Determine whether the source record should be ACCEPTed or REJECTed Action: if null. If ACCEPT IF NULL, this adds this clause to the source record statement. If REJECT IF NULL, then remove the NULL VALUE

clause(s).

40. NO ACTUAL DATA TO ASSIGN

The user specified ACTUAL DATA IN ORDER when no actual data exists. Cause:

This is a warning.

Action: None required; however, be aware of the fact that no actual data

has been assigned.

41. ACTUAL DATA TOO BIG FOR TARGET RECORD

The user specifies ACTUAL DATA IN ORDER for a source record which Cause:

contains more data than will fit in that target record. This is

a nonfatal error.

Action: Use explicit item assignments instead of ACTUAL DATA IN ORDER.

42. SET SIG ITEMS CANNOT BE ASSIGNED I THE STORE STORES OF THE SELECT

Set-significant source items were used on a TDLAP where ACCEPT Cause:

IF NULL was specified for one of the source records. This is

a nonfatal error.

Action: Alter the TDLAP so that all assignments and qualifications are

name as the source record have sourcified. This is a montain error

based on actual source items.

43. CONFLICTING SOURCE RECORD AND ACCESS

The source record is not a member or an owner of the access via Cause:

relation. This is a nonfatal error.

Check the source SDDL table dump (part of the IDS Analyzer output) Action:

to ensure that the source record name in the TDL description is

... rome (erefece a at real levera

and add or current the F

correct.

The source record is both the owner and the member of the relation. Cause:

This is a nonfatal error.

Determine if the record should be the owner or member of the Action:

relation and insert an CHNER/MEMBER or a MEMBER/CHNER clause.

45. NO NODE TO ATTACH SOURCE RECORD TO THE THEODOL ON JABRIET JAY LINE TO

Cause: The source record at the other end of the access via relation is not a node in the current TDLAP. This is a nonfatal error.

Action: Ensure that the correct access via relation was used and that the TDLAP tree nodes are constructed from root to leaves.

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a nontelel error a

: Sausa:

46. OWNER/MEMBER OR MEM/OWN INCORRECT

Cause: Owner/member was specified when member/owner is actually correct, or vice versa. This is a nonfatal error.

Action: Ensure that source record and access via relations are correct and change owner/member to member/owner or vice versa.

47. NODE ALREADY EXISTS ON ACCESS TREE

Cause: A source record has been placed on the TDLAP more than once.

This is a nonfatal error.

Action: Ensure that duplicate nodes on the TDLAP are desired.

48. ID MANDATORY FOR THIS SOURCE RECORD

Cause: The source record needs an ID to uniquely identify it. This is a nonfatal error.

Action: Add an ID = clause to the source record.

49. ID AND SOURCE RECORD NAME CONFLICT THE THIS OF TAKET BAT THEFT INCIDENT

Cause: The source record with the ID specified does not have the same name as the source record name specified. This is a nonfatal error.

relation. This is a nonfetal error.

This is a monfatal error.

Action: Determine which source record is desired and change the ID and/or source record specified.

50. QUALIFICATION ITEM NOT FOUND DE STORE STORE SELECTION STORE ST

Cause: The qualification item does not exist in the specified source group. This is a nonfatal error.

Action: Determine the source record where the qualification item exists and add or correct the From clause.

Gause; The source record is both the owner and the member of the relation.

Action: Determine if the record should be the earer or member of the relation and tasert an OWNER/MEMBER or a MEMBER/OWNER clause.

B-9 51. TDL DATA BASE TOO SMALL or PREVIOUS ERRORS OR ERRORS IN THE SDDL TABLES HAVE CAUSED A FATAL ERROR. Cause: Either the TDL database file is not large enough or an unreasonable error has occurred. Action: Recreate the TDL tables with a larger size. Check the IDS Analyzer output to ensure that no errors occurred and correct any errors encountered in the partial run of the TDL Analyzer. Activity 3 Errors ERROR ENCOUNTERED WHILE SETTING SYSACCS Action: Contact the Data Translation Project. **Activity 4 Errors** ERROR IN CONSTRUCTION OF COMPATIBILITY SETS Action: Contact the Data Translation Project. Activity 5 Errors 1. TDL TABLE INCONSISTENCY OR TDL DUMP PROGRAM ERROR Action: This is a fatal error. Any errors found in activity 2 should be corrected. If no activity 2 errors were detected, then contact the Data Translation Project.

APPENDIX C

n Managar 43..... Signayat 3

TIME and of proper a postage READER ERRORS o and norme SMICA NA 198453

These error messages are found on report code 06 Activity 2 (Activity 3 for the IDS Reader).

ALCO TON THAN BLANKING. LIGHTS NOT FOUND 1. ###ERROR....ACCIDS HAS AN IDS ERROR.

swit-ners a cale

An IDS error (not abort) has occurred in the Accessor module. Cause:

Action: Make sure the proper MD section was compiled with the Accessor. Check the IDS compilation for errors.

to regard in 105 Analyzed outdoor. Source causeses which have

2. ###ERROR....ACCISP HAS AN ISP ERROR.

An ISP error has occurred in the Accessor module. Cause:

Action: Be sure the ISP database is in the proper order. An error explanation will probably be in the execution report (\$\$). Action If possible, correct all errors which preceded this error.
Wise this can be fixed only by Data Translation personnel

wise, this can be fixed only by 3. ###ERROR ADBMS ERROR IN FILLIT.

An error condition has arisen in the internal database management Cause: system.

This error message will precede an ADBMS error message and trace Action: (see Appendix F for an explanation of ADBMS errors). If the error is #17 and the "DB=2" then increase the size of the source RIF and rerun the Reader. If the error is #17 and the "DB=3", then increase the size of DRT file and rerun the Reader. Otherwise, this error can be corrected only by Data Translation personnel. Cause: An error occurred while writing the ADMNS DBL few the SRIF.

4. ###ERROR....CALL TO NXTITM, NO CURRENT GROUP.

There is no current group in the SDDL tables. Cause:

This indicates a serious error has occurred in the logic of the Action: Reader. It will probably be preceded by other errors which should be corrected first. Otherwise, it can be corrected only by Data Translation personnel seve series action NOCE sevent 19099

Action: Weathers IDS Analyzer entrut, recreate the Source SDDL tables, 5. ###ERROR....COULDN'T GET ITEM INTO BUFFER, name.

An error has occurred while moving data from the source database to an internal buffer. This is a fatal error.

Action: Can be corrected only by Data Translation personnel.

6. ###ERROR....CR ERROR# n 3 ALGESTA

An ADBMS error has occurred while creating a record in the SRIF. Cause:

Action: Same as #3.

7. ###ERROR....DATABASE NAME NOT FOUND, name IGNORED.

The database name, "name", which the user specified as a run-time

parameter could not be found in the SDDL tables.

Action: Put the proper database name in the "NAME=" parameter in the run-

time parameter file and rerun the Reader. The correct name can be found in IDS Analyzer ouptut. Source databases which have

3 for the 405 Reducert

West Page

already been read in need not be reprocessed.

8. ###ERROR IN ADBMS DOL ANALYZER. A Destrock Est total 481 hA separa

This error message will be printed after other errors have occurred.

Action: If possible, correct all errors which preceded this error. Other-

wise, this can be fixed only by Data Translation personnel.

9. ###ERROR IN ADBMS DB INITIALIZATION. 284 9013 1963 1973 AA

Cause: This erver essage will precede an 405MS erver negated

Action: See #8 The characteristics as not 9 charges eas)

and resemble the Reader 17 the erect is \$17 and the "CO-3", then 10. FFFERROR IN DOL WRITER. Date sill The basts set seemont

An error occurred while writing the ADBMS DDL for the SRIF.

Action: Correct all errors which preceded this message. The user should

Action: This indicates a serious error has occurred in the logic of the

foold facent execute very bedraches so mea home and

end to usia end suserchi maid "Swall" and bas 1/4 at

be sure that the IDS Analyzer run creating the Source SDDL

tables had no errors. Git at the desired on at sment

The Source SDDL tables were created incorrectly. Cause:

As error has m.corred.while moving data from the source database

Action: Recheck IDS Analyzer output, recreate the Source SDDL tables,

and then run the Reader.

to an internal buffer. This is a fatal arror.

Action Can be corrected only by Data Translation personnel.

be corrected first. Otherwise, It can be

12. ###ERROR.....RECORD TYPE n NOT FOUND, SKIPPED.

Cause: The IDS record type n is not described in the source SDDL tables.

. isanozano

Causel See 110.

Action: See #85.

Carrier Sea 520.

Cause Personal

Action: See 45.

ES. *** SHOOM IN STEELER.

Action: Include the MD section for record type n with the rest of the MD section and run the IDS Analyzer to create the source SDDL tables. Then run the Reader.

of numeri and name2. It is not saint to not a pageton nototer that is a saint and the 105 Aralyza 13. ###ERROR PROBLEMS WITH MVB IN "STRPOP". ###FATAL ERROR, RIF WILL BE WRONG.

of the sup-modules and it can be dised only by Gata Translation See #5. Cause:

Action: See #5.

14. ###ERROR.....TRUNCATED DOUBLE WORD INTEGER. SET TO ZERO. OCTAL OF BUFFER (1) AND BUFFER (2).

An error has occurred while converting a double word integer to Cause: a single word integer.

in *** ere in cellin - Asser Simension of Pitem & Otley is TOO SMALL.

Action: This problem cannot be corrected. Due to data representation restrictions in ADBMS, all double word integers must be converted to single word integers. If truncation occurs in the conversion subroutine, that data item is set to zero. The line following this error message will have the octal representation of the double word integer which now equals zero.

15. ###FATAL ERROR...AMS ERROR# n. Water and the state of the state of

Cause: See #3.

Action: See #3.

16. ###FATAL ERROR...POPULATOR NOT OPENED.

The DRT was not properly initialized.

This error message should be preceded by other errors which should be corrected.

17. ###FATAL ERROR...PROBLEMS WITH MVB IN MAIN.

Cause: See #5.

Action: See #5.

###MARNING...THE SET name! IN THE RECORD name2 IS ASSUMED TO BE A 18. PHANTOM CHAIN.

The [DS record type in is not described to the The "NEXT" pointer field for the master record of set namel does Cause: not exist. The many broom her notices de any employ inois A AGE sorters end scheens of regularly ZOI got but bus notions On

Note that this message will be printed once for every occurrence Action: of name1 and name2. If the set name1 is not a phantom pointer relation, the 61 levels should be corrected and the IDS Analyzer should be rerun. If the 61 levels are correct and the set name! is not a phantom pointer relation, an error has occurred in one of the sub-modules and it can be fixed only by Data Translation personnel.

19. ***ERR IN GETITM--ARRAY DIMENSION OF PITEM & DITEM IS TOO SMALL.

Too many match-key items in one match-key relation. Cause:

Can be fixed only by Data Translation personnel.

***ERR IN GETITM--STATEMENT# n

Action: "Mis problem causet be certi Cause: This error message is printed only after other errors have occurred.

Cause: An error has accorred white convectings a double v

repains brow single a

Cause The DRT was not properly initialized.

IZ. ###FATAL ERROR. .. PROBLEMS WITH MYB IN MAIN.

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JEE 802 1800年35章

Cadedi See #5.

Action: See 45.

arispean's browl alonse of Action: If possible, correct all other errors which precede this message. Otherwise, this error can be fixed only by Data Translation personnel. Other alabase was doing the person brown sterios

21. ***ERR IN MKYREL--ERROR RETURN FROM GETITM.

See #19. Cause:

29 46.7

Action: See #19.

***ERR IN MKYREL--STATEMENTAN.O TOR SOTAJOROS. SOTAJOROS.

Action: Seco#20. renio ed bebecero ed blocke epasses ramas simil trattal

23. ***ERROR IN RT2SNM.

Cause:

Action: See #5.

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. NEW onc

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IT OMN'S STATEMENT OF

01% 002

Action: This error can be correct

Action: See #36.

Accient See 435.

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Note: Errors 24 through 33 are all the same. - 90448 - 9014 1909.

... POPULATOR - CHKSET GETS ADBMS ERROR# n 24.

...POPULATOR - CLSPOP GETS ADBMS ERROR# n 25.

...POPULATOR - CPYSET GETS ADBMS ERROR# n 26.

...POPULATOR - FANCHN GETS ADBMS ERROR# n 27.

... POPULATOR - GETFST GETS ADBMS ERROR# n 28.

...POPULATOR - GNEXT GETS ADBMS ERROR#n 29.

... POPULATOR - INSFST GETS ADBMS ERROR# n 30.

... POPULATOR - INSNXT GETS ADBMS ERROR# n 31.

...POPULATOR - POPINT GETS ADBMS ERROR# n 32.

... POPULATOR - UNION GETS ADBMS ERROR# n 33.

the records were found to be the eween of the sam See #3. Cause:

Action: See #3.

POPULATOR COPYING ERROR Key1 Key2.

The Populator was unable to move all the member records owned by Cause: Action: See #35.

Keyl to Key2.

Unless this error was preceded by some other errors, it can be Action:

corrected only by Data Translation personnel.

POPULATOR - DETAIL RECORD POINTS TO ITSELF.

The Populator tried to link a member record into a set. Cause:

record's "next" field was equal to its reference code.

The pointer fields are incorrect in the source IDS database. Action:

They must be corrected before the Reader will run. Data Translation personnel may be required to help find the record instances

in the IDS database which have the problem.

... POPULATOR - ERROR FROM GFIRST.

This error message will be preceded by other errors. Cause:

Action: If possible, follow the suggested action for all errors which

preceded this message. Otherwise, this error can be corrected

only by Data Translation personnel.

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n. 490992 2480A 8150 TIESTO - ROTADAGA...

CONFERENCE - GREAT GETS AGBRE (FRORE)

L. POPULATOR - INSEST GETS ABOUT FROME D

in theres are a liveral costs allower except a

AS CHARACTER START RECORD FOLVES TO LESSEE.

Cause: The Populator orded to Itek a member record in

n ARDING EMOGR STRO 909230 - ROTAJUNO9... USS

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Action: See 43:

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Action: The oxinter fields are inco

37. ... POPULATOR - ERROR FROM INSEST. IS DOWN EE ADDITION AS ENDING!

Cause: See #36.

Action: See #36.

38. ... POPULATOR - ERROR FROM UNION. DA 2130 72753 2 9074 909

Cause: See #36.

Action: See #36.

39. ... POPULATOR FOUND TWO REAL PARENTS IN IDS DB.

Cause: Two records were found to be the owner of the same set instance.

The Populator was unable to move all the nember

Action: See #35.

40. ... POPULATOR - INSFST INTERNAL ERROR

Cause: See #39.

Action: See #35.

41. ... POPULATOR - INSNXT INTERNAL ERROR.

Cause: See #39.

Action: See #35.

42. ... POPULATOR - INTERNAL ERROR IN DRT.

Cause: A relation is missing the DRT or a sibling name has been

and the crown and proceeded by substances armoved the can be

omitted.

Action: This error can be corrected only by Data Translation personnel.

in the IDS database which have the problem.

record's "mest" field was equal to its reference code.

43. ... RECORD TYPE IS NEITHER MASTER NOR DETAIL.

Cause: The Populator module was passed bad data.

Action: This error can be corrected only by Data Translation personnel.

44. ... POPULATOR - RECORDS ACCESSED OUT OF SEQUENCE.

Cause: A record was retrieved whose reference code was less than or

equal to the preceding record's reference code.

Action: There are several reasons why the reference codes are not in

ascending order. That situation is left to the user to correct,

after which the entire Reader should be rerun.

45. ... POPULATOR - ROUTINE POPLAT ADBMS ERROR# n.

Cause: See #3.

Action: See #3.

46. ... POPULATOR - TABLES NOT INITIALIZED.

Cause: The DRT was not successfully initialized.

Action: Unless this message was preceded by other errors which can be

corrected, this error can be corrected only by Data Translation

personnel.

47. ... POPULATOR - TROUBLE INITIALIZING DRT.

Cause: This error message will probably be preceded by other error

messages.

Action: Follow the action detailed for the other errors. If there were

no preceding error messages, be sure the SDDL tables were created

correctly.

48. ... POPULATOR - UNION HAS INTERNAL ERROR IN DRT.

Cause: This error message will be preceded by other error messages.

Action: See #3 and #35.

APPENDIX D

4 ERRER IN INVOL. 1 POS-

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RESTRUCTURER ERROR MESSAGES

This appendix contains a list of all Restructurer error messages alphabetized by

- 1) numeric characters
- alphabetic characters
- special characters 3)

Restructurer errors are of two types. Non-fatal errors allow the Restructurer to continue executing in order to detect as many problems as possible in one run. Fatal errors terminate the run immediately, since they are usually of a nature that makes further execution pointless (e.g., unable to open a database). Some error conditions are recoverable; for example, if the Restructurer buffer space is not sufficient to access a group of compatible access paths all at once, it will attempt to access as many together as it has room for and will access the rest separately.

An error which the Restructurer is unable to recover from causes the cancellation of Activity 03, the \$UTILITY copy of the Target RIF database back to the permanent file. In the error-explanations that follow, assume this is the case unless it is mentioned specifically that the

results of the run will still be consistent.

In the explanations that follow, "Cause" describes the probable cause of the error condition. "Action" describes the action taken by the Restructurer if the particular error condition occurs.

1. ERROR IN COMPAR. IPOS=, IERR=
Cause: An error has occurred while performing qualification on a source record instance.
Action: More error messages will follow.
2. ERROR IN CONSTR. I-OS=, IERR=
Cause: An error has occurred while attempting to build a target record instance.
Action: More error messages will follow. Too see top passed to the too.
3. ERROR IN CONVRT. IPOS- IERR- DE DE PROPIE DE
Cause: An error has occurred while item conversion (e.g., integer-to- character type) was being performed prior to assigning data to a target item.

An error has accounted during the Restructioner von that caus Action: More error messages will follow. At the party of the same or Job aborted by made. Sesuits of the run will be inconsisted

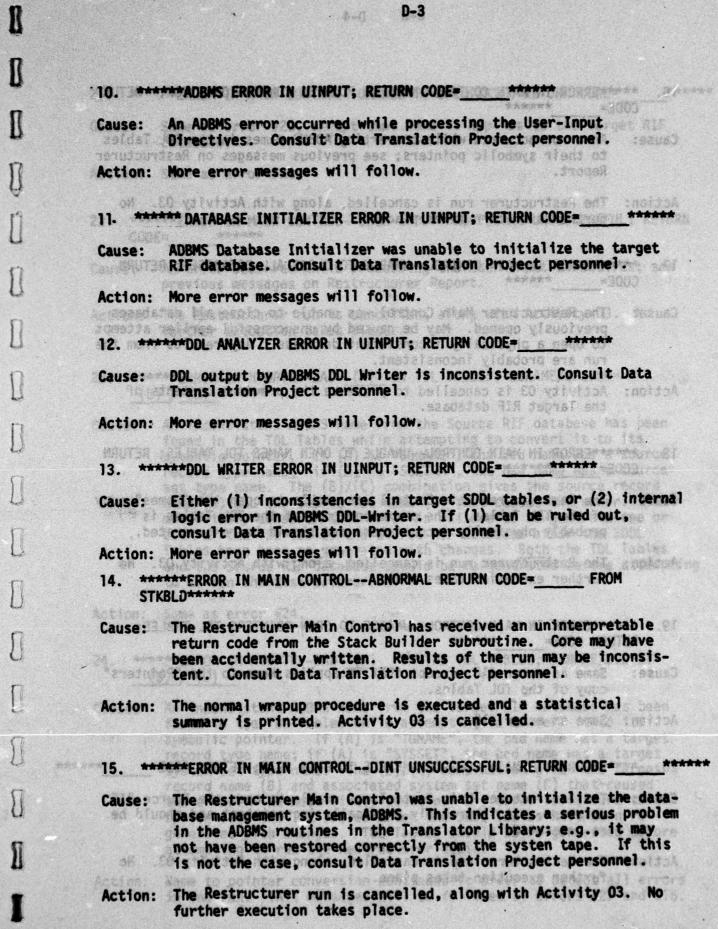
saffacines at ED estates and alegality of the conceller

The References about groceoute is executed and a statistical

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4. ERRO	R IN INTQL1. IPOS=, IERR=
Cause:	An error has occurred while performing an inter-item qualification.
Action:	More error messages will follow. The enterior repeates and yo besidesing to
5. ERRO	R IN INTQL2. IPOS=, IERR=
Cause:	An error has occurred while performing an inter-item qualification.
, V W	More error messages will follow.
6. ERRO	R IN QUAL. IPOS=, IERR=
Cause:	An error has occurred while performing qualification on a source record instance.
Action:	More messages will follow. The same of the
7. ERRO	R IN SITMMV. IPOS=IERR=
Cause:	An error has occurred while assigning source item values to their corresponding target items.
	More messages will follow. The contract of the
7.5 STAT	TISTICS INCOMPLETE DUE TO LACK OF STORAGE AND ME HOUSE
Cause:	Because of a lack of storage for statistics, the Restructurer was unable to compile statistics for the entire run. While the statistical summary will be incomplete, this in no way affects the success or failure of the run.
Action:	Normal execution of the wrapup procedure continues.
CONTROL OF THE PROPERTY OF THE	##END-OF-FILE DETECTED ON USER INPUT#END-USER-INPUT CARD SEASON LATED#####
Cause:	#END-USER-INPUT Directive was not used. This is merely a warning and not an error.
Action:	End of User-Input Directives is assumed.
ar-to-	Cause: An error has occurred while item conversion (e.g., integ
9. ****	**ABORT*****ABORT*******ABORT******** (eqt
Cause:	An error has occurred during the Restructurer run that caused the operating system to terminate it (e.g., processor time exceeded), or job aborted by user. Results of the run will be inconsistent.

Action: The Restructurer abort procedure is executed and a statistical summary is printed. Activity 03 is cancelled.



16. *****ERROR IN MAIN CONTROL--NAME TO POINTER CONVERSION ERROR; RETURN
CODE=_____

Cause: An error occurred while converting ADBMS names in the TDL Tables to their symbolic pointers; see previous messages on Restructurer Report.

Action: The Restructurer run is cancelled, along with Activity 03. No further execution takes place.

- 17. ******ERROR IN MAIN CONTROL---UNABLE TO CLOSE ALL DATABASES; RETURN CODE=____******
- Cause: The Restructurer Main Control was unable to close all databases previously opened. May be caused by unsuccessful earlier attempt to open a physically inconsistent database. Any results from the run are probably inconsistent.

Course - ADRES Database Initializar was unable to Unitialize the terror

- Action: Activity 03 is cancelled to preserve the previous contents of the Target RIF database.
- 18. ******ERROR IN MAIN CONTROL--UNABLE TO OPEN NAMES TOL TABLES; RETURN CODE= ******
- Cause: The Restructurer Main Control was unable to open the "Names" copy of the TDL Tables. The permanent copy of the TDL Tables is probably physically inconsistent and should be re-generated.
- Action: The Restructurer run is cancelled, along with Activity 03. No further execution takes place.
- 19. ******ERROR IN MAIN CONTROL -- UNABLE TO OPEN POINTERS TOL TABLES; and RETURN CODE- on ****** validated and the state of the validation validation validation validation and the state of the validation validatio
- Cause: Same as error #18, except that it applies here to the "Pointers" copy of the TDL Tables.

Action: Same as error \$18.5 at 60 yatvisca. Setting at yearsus

20. *****ERROR IN MAIN CONTROL--UNABLE TO OPEN SRIF; RETURN CODE-____******

Action: The cormal wrappo procedure is exacuted and a statistic

further execution takes o'acc.

- Cause: The Restructurer Main Control was unable to open the Source RIF database. It is probably physically inconsistent and should be re-generated.
- Action: The Restructurer run is cancelled, along with Activity 03. No further execution takes place.

21. *****ERROR IN MAIN CONTROL--UNABLE TO OPEN TRIF; RETURN CODE-

Same as error #20, except that here it applies to the Target RIF detabase: "The straint and after make their hand and an account may there a

travers of priceselfs of the asion off any or project

Action: Same as error #20. a of associated of transfer allocates and sample and sample policy of the sample of the

22. *****ERROR IN MAIN CONTROL--USER-INPUT PROCESSING UNSUCCESSFUL; RETURN CODE= Attent attention to the tenth of at 1

SALVAS JOST DE 21 11 D

An error occurred while processing the User-Input Directives; see

previous messages on Restructurer Report.

The Restructurer run is cancelled, along with Activity 03. No further execution takes place.

23. *****ERROR IN NTOPTR--BAD (A) IN TDL TABLES; SGNAME/SSETNM-(B) / (C) *****

Cause: An inconsistent ADBMS name from the Source RIF database has been found in the TDL Tables while attempting to convert it to its symbolic pointer. If (A) is "SGNAME", the bad name was a source record type name; if (A) is "SSETNM", the bad name was a source set type name. The (B)/(C) combination gives the source record name (B) and the source set name (C) that caused the error. The most likely cause of this error is failure to re-generate one or both of the TDL Tables and Source RIF database after the SDDL Tables have been re-generated with changes. Both the TDL Tables and the Source RIF database should be re-generated before attempting to re-run the Restructurer.

Action: Same as error #24. Actions have to pointer conversion is dozen this message will be soller

24. *****ERROR IN NTOPTR--BAD (A) IN THE TDL TABLES; TGNAME/SYSSET= (B) / (C) *****

An inconsistent ADBMS name from the Target RIF database has been Cause: found in the TDL Tables while attempting to convert it to its symbolic pointer. If (A) is "TGNME", the bad name was a target record type name; if (A) is "SYSSET", the bad name was a target system set type name. The (B)/(C) combination gives the target record name (B) and associated system set name (C) that caused the error. The most likely cause of this error is failure to re-generate the TDL Tables after the SDDL Tables have been regenerated with changes. TDL Tables should be re-generated before attempting to run the Restructurer again.

Name to pointer conversion continues in order to detect all errors in one run. This messages will be followed by errors #27 and #16.

25. ******ERROR IN NTOPTR--BAD SINAME IN TOL TABLES- (A); SGNAME/SSETNM-

Cause: An inconsistent ADBMS name from the Source RIF database has been found in the TDL Tables while attempting to convert it to its symbolic pointer. In this case, it is a bad source item name, given by (A). The (B)/(C) combination gives the source record type (B) of which it is an item, and the source set name (C) associated with the source record name by virtue of being a set along which (B) is accessed in a particular access path. See error #23 for likely cause.

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Action: Same as error #24.000% detector trad ou appropriate authority

26. ******ERROR IN NTOPTR--BAD TINAME IN TDL TABLES-_(A); TGNAME=

Cause: An inconsistent ADBMS name from the Target RIF database has been found in the TDL Tables while attempting to convert it to its symbolic pointer. In this case, it is a bad target item name, given by (A); (B) gives the target record type of which (A) is an item. See error #24 for likely cause.

Action: Same as error #24. "Martica" of (A) of the second of body a broken specific action (A) the second of the broken specific action (A) the second of th

27. ******ERROR IN NTOPTR--THE ABOVE ADBMS NAMES FROM THE TOL TABLES ARE INCONSISTENT*****

Cause: Inconsistent ADBMS name(s) from the TDL Tables have been found in the TDL Tables while attempting to convert them to their symbolic pointers. See previous messages on Restructurer Report.

28. ******ERROR IN RSTABT--UNABLE TO CLOSE ALL DATABASES; RETURN CODE-

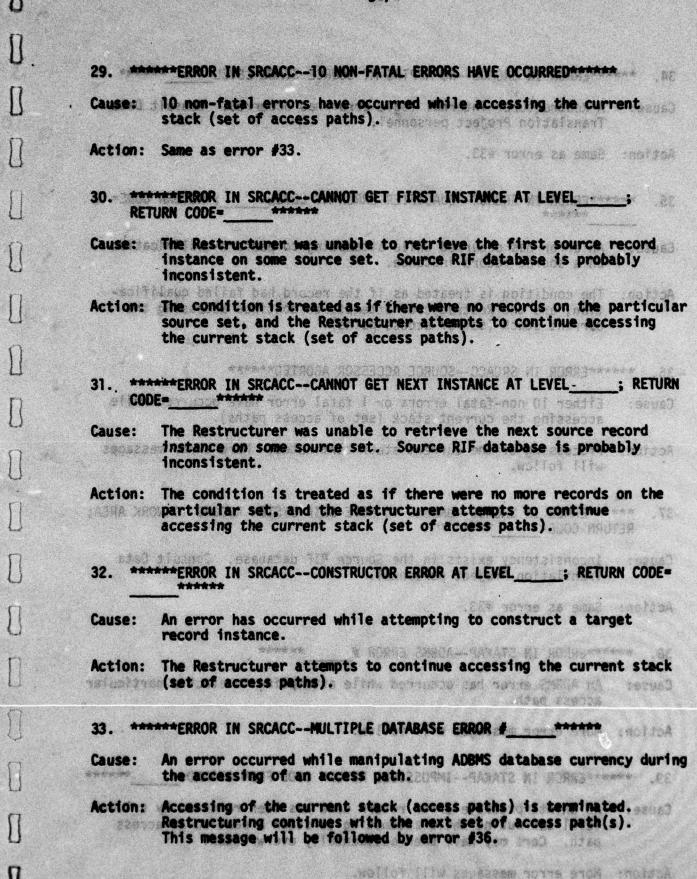
Cause: The Restructurer abort routine was unable to close all open databases following an error that produced error #9. Results of the run will be inconsistent.

attempting to run the Mastructurer again.

Action: The run is terminated by the operating system. To the sub-

denerated with changes. TOL Tables should be re-cenerated before

Name to pointer conversion continues in order to detect all errors in one run. This assertes will be followed by errors 427 and 716.



4.	***ERROR IN SRCACCNO APPTRS AT SOURCE STACK LEVEL******
ause:	A Restructurer internal Togic error has occurred. Consult Data Translation Project personnel.
Action:	Same as error #33ECK rowns as smet coultoA
5. *** —	****ERROR IN SRCACCQUALIFIER ERROR AT LEVEL; RETURN CODE-
Cause:	An error has occurred while attempting to perform qualification on a source record instance.
Action:	The condition is treated as if the record had failed qualification, and the Restructurer attempts to continue accessing the current stack (set of access paths).
36. **	****ERROR IN SRCACCSOURCE ACCESSOR ABORTED*****
	Either 10 non-fatal errors or 1 fatal error have occurred while accessing the current stack (set of access paths).
	Processing of the current stack terminates. More error messages will follow.
27 **	TURN CODE=
Cause:	THE REST OF THE PARTY AND ADDRESS OF THE PARTY OF THE PAR
Action:	Same as error #33. Cause: An error has occurred while attempting to construct a targ
38. *** Cause:	An ADBMS error has occurred while attempting to stack a particular access path.
Action:	More error messages will Afollow SITION - STANKE WI RORRS*****
1746 yr 39. ••	****ERROR IN STAKAPIMPOSSIBLE RETURN CODE FRON STAKNO-1
Cause:	An uninterpretable error return code has been returned by a lower level subroutine while attempting to stack a particular access path. Core may have been accidentally overwritten.
Action	More error messages will follow.

40. EXH	***ERROR IN STAKAPUNABLE TO STACK ACCESS PATH; APPTR STORAGE AUSTED****
Cause:	The Restructurer was unable to put a particular access path on the stack due to lack of internal buffer space.
Action:	More error messages will follow.
41 68 688	***ERROR IN STAKAPUNABLE TO STACK ACCESS PATH; ROOT KEY-
Cause:	An error has occurred while attempting to stack a particular access path.
Action:	More error messages will follow.
42. ***	****ERROR IN STAKAPUNABLE TO UNSTACK PARTIAL ACCESS PATH*****
Cause:	An error has occurred in an error recovery procedure which was attempting to salvage the logically consistent part of a stack (set of access paths).
Action:	More error messages will follow. AND THE STORES AND TO THE STORES AND THE STORES AND TO THE STORES AND
43.	****ERROR IN STAKNOADBMS ERROR # SWITCH=******
Cause:	An ADBMS error has occurred while attempting to put a source record type from an access path on the stack.
Action:	More error messages will follow.
My wester	****ERROR IN STAKNDAPPTR STORAGE EXHAUSTED*****
Cause: Action:	Same as error #47. More error messages will follow.
45. **	****ERROR IN STAKNOBAD APPTR INDEX RETRIEVED FROM NODE RECORD_
IN Cause:	DEX. And a proteing althe hermone can force of second Same as error \$49. 22 uses error question entrop second construction.
Action:	More error messages will follow.

	ERROR IN STAKNONODE RECORD NOT A MEMBER OF AN INSTANCE OF HER OM OR MO; SWITCH=****
Cause:	Same as error #49. More error messages will follow.
	Accide Mode error meseages will follow.
47. ***	****ERROR IN STAKNOSRCSTK STORAGE EXHAUSTED*****
ar i	The Restructurer was unable to put a source record type from an access path on the stack due to lack of internal buffer space.
Action:	More error messages will follow.
	Action: More errar messages will follow.
48. ***	***ERROR IN STAKNDUNABLE TO STACK NODE=******
2 6w A	An error has occurred while attempting to put a source record type from an access path on the stack.
Action:	More error messages will follow. (thing resolution to the)
49. *** OF	***ERROR IN STAKNDTDL DDL INDICATES NODE RECORD NOT LEGAL MEMBER OM AND/OR MO; SWITCH=*******
327	Inconsistency exists in the TDL Tables. Consult Data Translation Project personnel.
Action:	More error messages will follow.
	###ERROR IN STAPRTADBMS ERROR # *****

Cause:	An ADBMS error has occurred during the wrapup procedure. Results of the run may be inconsistent.
Action:	Wrapup procedure is terminated at the point of the error.
51.	***ERROR IN STAPRTMULTIPLE DATABASE ERROR #******
Cause:	An error has occurred while manipulating ADBMS database currency during the wrapup procedure. Results of the run may be inconsistent.
Action:	Wrapup procedure is terminated at the point of the error.

52.	***ERROR IN STKBLDADBMS ERROR******	identi
Cause:	An ADBMS error has occurred during the stacking of ac	ess
Action:	The current access path is discarded and restructuring with the next access path.) CO
53.	***ERROR IN STKBLDIMPOSSIBLE RETURN CODE FROM =	10分别
Cause:	A lower level routine has returned an uninterpretable code while preparing a stack. Core may have been accoverwritten.	err i den
Action:	Same as error #55.	
54. ***	***ERROR IN STKBLDINCOMPLETE BUT USABLE STACK; RETUR	N CI
Cause:	An incomplete but logically consistent stack has been Results of the run may be inconsistent. Study Statis carefully, along with any other error messages on the Consult Data Translation project personnel if necessary	re ry.
Action:	Restructuring continues with the current stack.	
55. ***	***ERROR IN STKBLDMULTIPLE DATABASE ERROR #***	***
Cause:	An error has occurred while manipulating ADBMS databaduring the stacking of an access path.	se i
Action:	Restructuring stops at the point of the error.	2.51
56.	***ERROR IN STKBLDSTACK ABORTED*****	g var
Cause:	Errors have occurred rendering the current stack usel	ess
Action:	The stack is discarded. Restructuring continues with access path.	th
57. ***	***ERROR IN STKBLDSTACK BUILDER ABORTED*****	
Cause:	Serious errors have occurred that warrant termination Restructurer run.	
		CONTRACTOR AND ADDRESS.

RET	TURN CODE-			
Cause:	The indicated stack the corresponding ac	was not processe	ed successfully. Re	sults from
Action:	Restructuring continu		kt access path.	
andler t	CODE=	NABLE TO ALLOCAT	anthum level newsi	; RETURN
Cause:	The Restructurer was the current stack.	unable to allo	cate work area store	ge for
Action:	Same as error #52.		. del morre de en	62 : 106 9 97
60. ***	***ERROR IN STKBLDU	NABLE TO DUMP S	TACK NO; RETU	IRN CODE=
Cause:	Restructurer interna Project personnel.	1 locic error.	Consult Data Transl	ation
Action:	Same as error #55.		uniones primisers	
61. ***	ERROR IN STKBLDUN			
Cause:	The Restructurer was Consult Data Transla			
Action:	Restructuring stops	at the point of	the error:	Auston: R
	E			
Cause:	The Restructurer was	unable to put	the first access pat	h selected
Action:	Restructuring stops		distriction is	
	****ERROR IN STKCMPA	DBMS ERROR #	TRANS IN STREET	
	Same as error #52.		erious arrors have o estructurer run.	
Action:	Same as error #52.	bosenimest v	lengisment of min an	action: Ti

Cause: Errors have occurred rendering the current stack useles. Action: Same as error #52. 66. *********************************	Action: Same as error #53. 65. *******ERROR IN STKCMPSTACK HAS LOST ITS INTEGRITY: FIRST Cause: Errors have occurred rendering the current stack useles Action: Same as error #52. 66. *******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCES FOR FIRST ROOT; STACK STILL USABLE***** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. ******ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE STATES Cause: Same as error #60. 68. ******ERROR IN STKDMPBAD STKBTM PASSED********************************	IN STKCMP—STACK HAS LOST ITS INTEGRITY: FIRST integrity:		**ERROR IN STKCHPIMPOSSIBLE RETURN CODE FROM STAKAP-
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Cause: Errors have occurred rendering the current stack useles. Action: Same as error #52. 66. *********************************	Cause: Errors have occurred rendering the current stack useles Action: Same as error #52. 66. *******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCES FOR FIRST ROOT=; STACK STILL USABLE***** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. ******ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S ******ERROR IN STKDMPBAD STKBTM PASSED=* Cause: Same as error #60. Action: Same as error #60. 69. *****ERROR IN STKDMPBAD STKBTM PASSED=* Cause: Same as error #60. 69. ******ERROR IN STKPRPADBMS ERROR #* Cause: Same as error #52. Action. Same as error #52. 70. ******ERROR IN STKPRPMULTIPLE DATABASE ERROR #* *******************************	have occurred rendering the current stack useless error #52. IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCESS (NOT=; STACK STILL USABLE****** have occurred preventing the stacking (together) of compatible access paths. curing continues with a partial stack. IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S error #60. R IN STKDMPBAD STKBTM PASSED=***** s error #60. R IN STKDMPADBMS ERROR #**** s error #52. R IN STKPRPMULTIPLE DATABASE ERROR #** s error #55. R IN STKPRPMULTIPLE DATABASE ERROR #** s error #55.	Action:	Same as error #53. Horne and . basets in it covers no
Action: Same as error #52. 66. *******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCES. FOR FIRST ROOT= ; STACK STILL USABLE***** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. ******ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S *******ERROR IN STKDMPBAD STKBTM PASSED= ****** Cause: Same as error #60. Action: Same as error #60. 69. ******ERROR IN STKDMPADBMS ERROR ***** Cause: Same as error #52. Action. Same as error #52. 70. ******ERROR IN STKPRPMULTIPLE DATABASE ERROR ****** Cause: Same as error #55.	Action: Same as error #52. 66. *******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCES FOR FIRST ROOT=; STACK STILL USABLE****** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. ******ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE STATES. Cause: Same as error #60. Action: Same as error #60. Action: Same as error #60. 69. ******ERROR IN STKDMPBAD STKBTM PASSED=******* Cause: Same as error #60. 69. ******ERROR IN STKPRPADBMS ERROR #****** Cause: Same as error #52. Action. Same as error #52. Action. Same as error #55.	error #52. IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCESS NOT=; STACK STILL USABLE**** have occurred preventing the stacking (together) of compatible access paths. turing continues with a partial stack. IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S error #60. R IN STKDMPBAD STKBTM PASSED=*** s error #60. R IN STKPRPADBMS ERROR #** error #52. R IN STKPRPMULTIPLE DATABASE ERROR #* s error #55. s error #55.	65. ***	表现"我是否是基本的 家 是是是是不是是这些人,是是是我们的,我们就是这个人,我们就是这个人,我们就是这个人,我们也不是一个人,我们就是一个人,我们就是一个人,我们
66. *******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCESS FOR FIRST ROOT= ; STACK STILL USABLE****** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. *****ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S ******ERROR IN STKDMPBAD STKBTM PASSED= ****** Cause: Same as error #60. Action: Same as error #60. 69. ******ERROR IN STKDMPADBMS ERROR ***** Cause: Same as error #52. Action. Same as error #52. 70. ******ERROR IN STKPRPMULTIPLE DATABASE ERROR ***** Cause: Same as error #55.	66. ******ERROR IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCES FOR FIRST ROOT=; STACK STILL USABLE***** Cause: Errors have occurred preventing the stacking (together) group of compatible access paths. Action: Restructuring continues with a partial stack. 67. ******ERROR IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE : ***********************************	IN STKCMPUNABLE TO STACK ALL COMPATIBLE ACCESS HAVE occurred preventing the stacking (together) of compatible access paths. Lituring continues with a partial stack. IN STKDMPBAD APPTR INDEX DETECTED IN SOURCE S THE STRUMPBAD STKBTM PASSED= S error #60. R IN STKDMPBAD STKBTM PASSED= S error #60. R IN STKPRPADBMS ERROR #	一种"新"等。对"新"等	
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Cause: Same as error #55.11 a polyphoxy asw messpond dugol-ne	Cause: Same as error #55. 1 a politopoxy few rosspord fugni-ne	s error #55.0 a philosopa and toeshoord light-re so topic single read was not a legal offer your so to a TOLAP name fallowing the ALL. 201 norms s	Action.	Same as error #52, source at aprisosable sugar-ance to
Cause: Same as error #55. A philosopie and reasoned furnities Action: Same as error #55. A part publication of the part of the	Cause: Same as error #55. A philosopie saw tossecond dugal-to	a rout line read was not a legal array and income a rouse to a TOLAP name following the ALL. 25% norms a	70. **	****ERROR IN STKPRPMULTIPLE DATABASE ERROR
Action: Same as error #55. Is not published about 98 UT & 21 Mars	Action: Same as error #55. 14 out naturally some daily a 21 des	a rout line read was not a legal array and income a rouse to a TOLAP name following the ALL. 25% norms a	Cause:	Same as error #55.00 a philophia saw rossepon Turni-
			Action	Same as error #55. Is out notwolfed most PAIGT a 21 mg

77. ******ERROR IN STKPRP--NORK AREA STORAGE EXHAUSTED******

Cause: Initialized work area space is insufficient for the current stack.

Action: Error recovery is initiated. See error #86.

72. *****ERROR IN UINPUT--ACTIVE-TDLAPS CARD ALREADY ENCOUNTERED; CARD WAS--

Cause: User Input Processor has read a second #ACTIVE-TDLAPS directive; only one is allowed.

Action: The bad card is printed following the message. Processing continues to find more errors, if any.

73. ******ERROR IN UINPUT--EXECUTION-MONITOR CARD ALREADY ENCOUNTERED;
CARD WAS--

finders have occurred overencing the stacking (together) of a

Cause: User Input Processor has read a second #EXECUTION-MONITOR=
directive; only one is allowed.

Action: Same as error #72.

74. ******ERROR IN UINPUT--EXPECTING HASH INFO AFTER USER-HASH-INPUT CARD; CARD WAS--

Cause: Same as error 480.

Action: Same as error #6D.

Same as error #60.

eause:

Cause: #USER-HASH-INPUT directive was not followed by any hash input statements.

Action: Same as error #72.

75. ******ERROR IN UINPUT--EXPECTING HASH INFO AFTER USER-HASH-INPUT CARD; GOT EOF*****

Cause: #USER-HASH-INPUT directive was last line of User-Input Directives; it must be followed by at least one hash input statement.

Action: End of User-Input Directives is assumed. The season

76. *****ERROR IN UINPUT--EXPECTING RESTRUCTURER CONTROL CARD; CARD WAS--

Cause: User-Input Processor was expecting a User-Input Directive, but the input line read was not a legal directive. Most probable cause is a TDLAP name following the ALL-TDLAPS-ACTIVE keyword.

Action: Same as error #72.

77. *****ERROR IN UINPUT--EXPECTING TOLAP NAME AFTER ACTIVE-TOLAPS CARD: CARD WAS--Cause: A User-Input Directive immediately followed the #ACTIVE-TDLAPS directive. At least one TDLAP name or ALL-TDLAPS-ACTIVE must follow #ACTIVE-TDLAPS. MAN LOUNS Action: Same as error #72. SI, MONTH SERVICE AS BENELT WILLIAM THEORY CARD ALPEADY ENCOUNTERFOR ******ERROR IN UINPUT--EXPECTING TOLAP NAME AFTER ACTIVE-TOLAPS CARD: GOT EOF #ACTIVE-TOLAPS directive was last line of User-Input Directives. It must be followed by at least one TDLAP name or ALL-TDLAPS-Action: Same as error #75. ******** CSLIAR YEAVOOR RESERVENCE . 20 79. ******ERROR IN UINPUT--ILLEGAL OPTION ON EXECUTION-MONITOR CARD; CARD MAS - vnux opi mort fluggy you and to good berevoner ad red countrible. Assistanting-presents thould be EXECUTION-MONITOR-directive not followed by either ON or OFF Cause: with no intervening blanks. These are the only two options available. Action: Same as error #72. CALLIANTING-3- ASM ARCR (CITALTING YESPONDS NORSETTED ... AB 80. *****ERROR IN UINPUT--ILLEGAL OPTION ON RUN CARD; CARD WAS-aga assa grow ber #RUN-directive not followed by either INITIALIZE or CONTINUE Cause: with no intervening blanks. These are the only two options Same as error #72. California (Action: 81. *****ERROR IN UINPUT--ILLEGAL RESTRUCTURER CONTROL CARD; CARD WAS--The input line read was not a legal User-Input Directive. Cause: Probably misspelled or contains imbedded blanks. as this error condition is conterned; Action: Same as error #72. that the case presents *******ERROR IN UINPUT--RUN CARD HAS ALREADY BEEN ENCOUNTERED; CARD WAS--User-Input Processor has read a second #RUN=directive; only one Cause: is allowed.

Action: Same as error #72.

83. *****ERROR IN UINPUT--TDLAP NAME (A) NOT FOUND ON ROOTS SET*****

Cause: The user has requested TDLAP (A) to ta active; however, no such TDLAP name exists in the TDL tables. Check TDL description for correct spelling.

Action: Processing continues to find more errors, if any.

84. ******ERROR IN UINPUT--USER-HASH-INPUT CARD ALREADY ENCOUNTERED; CARD WAS--

Cause: User-Input Processor has read a second #USER-HASH-INPUT directive; only one is allowed.

Action. Same as error and

Afocileve

Acetom: Same as error #72.

-- 2014 1000

Lamports of

Action: Same as arour \$72

Action: Same as error #72.

85. *****ERROR RECOVERY FAILED*****

Cause: The error condition associated with errors #71 and #86 could not be recovered from. This may result from too many access paths being compatible. Restructuring-by-parts should be used; i.e., only a few active access paths per run.

Action: More error messages will follow.

86. *****ERROR RECOVERY INITIATED; WORK AREA RE-INITIALIZED WITH_____

Cause: Lack of initialized work area space.

Action: More work area space is initialized. Either error #87 or #85 should follow this message.

87. *****ERROR RECOVERY SUCCESSFUL******

Cause: The error condition associated with errors #71 and #86 has been successfully recovered from.

Action: Restructuring continues. Results of the run will be good as far as this error condition is concerned; i.e., Activity 03 will not be cancelled.

Course: Hyay-Input Processon has read a second eRunnistractives only one

82. ******ERRIR IN BIGNUT -- RUN CARD HAS ALITADY BUTW ENCOUNTERFOR

88. ***	***ERROR(S) IN PHASE IIABNORMAL TERMINATION*****
Cause:	Fatal error(s) during Phase II of the Restructuring run caused premature termination of execution. Results of the run are probably inconsistent.
Action:	The normal wrapup procedure is executed and a Statistical Summ is printed. Activity 03 is cancelled.
89. ***	***ERROR(S) IN PHASE II, BUT ABLE TO TERMINATE NORMALLY*****
Cause:	Non-fatal error(s) occurred during Phase II of the Restructure run, but none serious enough to warrant premature termination the run. Results of the run are probably inconsistent.
Action:	The normal wrapup procedure is executed and a Statistical Summis printed. Activity 03 is cancelled.
	****EXECUTION DISASTER IN NAME TO POINTER CONVERSION LINE#=
Cause:	An error has occurred in an ADBMS subroutine while converting ADBMS names in the TDL Tables to their symbolic pointers. TDL Tables may be physically inconsistent and should be re-generated if this is not the case, consult Data Translation Project personnel.
Action:	Name to pointer conversion terminates immediately. This messawill be followed by error #16.
91. ***	****MULTIPLE DATABASE ERROR IN UINPUT; RETURN CODE=******
Cause:	An error occurred while manipulating ADBMS database currency during processing of the User-Input Directives. Consult Data Translation Project personnel.
Action:	Processing of the User-Input Directives terminates immediately More error messages will follow.
92. ***	***RESTRUCTURER ABORT PROCEDURE DONE*****
	This message indicates that the Restructurer abort procedure
Cause:	finished (see error #9).

******RESTRUCTURER RUN CANCELLED****** II 32AH4 MI (2)MDRH (***** BB Cause: A fatal error has occurred in Phase I of the Restructurer run; see previous messages on Restructurer Report. crobably inconsistent Action: Self-explanatory; no restructuring will be performed. all to be a designation of a companies and a companies of a is printed. Activity 03 to cancelled ******WARNING--TRANS-NAME CARD ALREADY ENCOUNTERED; FOLLOWING CARD IGNORED --******ERECR(5) IN SMASE II, NOT WALE TO TERRINATE User-Input Processor has read a second #TRANSLATION-NAME=directive; Cause: only the first one is accepted. This is not an error, only a the run. Passing of the run are probably income acent. Action: Same as error #72. Actions. The normal wrapur procedure is executed and a Statistical on its orinted. Softwitte 03 W cancelling. ******CYSCOTION DISASTER IN MANE TO POINTER CONVERS DOLLARES An error has becarred in an ACRES subroutine wille converting AUGMS manues to the TOL Tables to their sympolic admiters. The Fables may be physically inconstagent and should be respensived. if shis is not the cost, consult Data Translation Project 1 Statogrego News to pointer convergous terminates immediately. This message 1.按数字类型的 will be followed by error #16. **建筑建筑设设** 91, ******MILTIPLE DATASASE ERROR IN WINDLES RESURN CODE= An error occurred while wantpulating ADBMS database currency (Auton) during processing of the User-Input Priectives, Contail Date Translation Project personnel. Processing of the Gear-Input Directives terminates immediately. Actions More error messades will follow. ******* DONE PROJECTION OF THE PROJECT This message indicates that the Restructurer abort procedure : 52(18) finished (see error #8). The run is terrologised by the operating system.

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TARTE CANDOL OF DESTRICT APPENDIX E DOCUMENTS OF THE STARTE OF THE START

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writer errors

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Action: See error FC

Errors in the Writer can be divided into three classes according to their degree. The most serious cause the Writer immediately to terminate with a FORTRAN STOP statement. Less serious errors will print a message, cause an error recovery action to be initiated which, in turn, continues execution. These errors generally have a multiplicative effect and force more errors as the Writer continues to execute. Finally, there are warnings which generally refer to problems with items within records. For almost every application, all nonfatal errors and warnings must be corrected, thus, forcing a rerun of the Writer and, in some extreme cases, a rerun of other Translator modules. Sophisticated users can correct some minor problems by writing a special-purpose program to alter the target database if a rerun of the Writer cannot be justified.

Documentation for all Writer errors appears in this appendix. Each error message is given a number and cross-references are sometimes made. Information as to whether or not the error is fatal/nonfatal, which activity the error occurs in, cause, the action to be taken to correct each error, are given. All occur in activity #4 and are sorted alphabetically to allow easy reference. The collating sequence followed is:

- Numeric characters.
 Alphabetic characters.
- 3) Special characters.
- 1. "RECORD TYPE NOT STORED IS PROBABLE CAUSE ALL OF ITS MASTER RECORDS HAVE NOT BEEN STORED YET."
- Cause: A run of the Writer on only part of the database has failed to store the record type mentioned in the error message because the master of this record type was not specified by the user to be written on this or a prior run. This is a nonfatal error.
- Action: Rerun the Writer by including the master of this record type among those to be written, or remove this record type from the list of those to be written.
- 2. "###ERROR...ADBMS ERROR OCCURRED DURING RETRIEVER ATTEMPT TO GET RECORD-____FIELD NAME-____WITH DBKEY-____"
- Cause: Accompanied by the ADBMS trace listing on RC-06, a Writer initializing routine suffered an ADBMS error. This fatal error is a sign of seriously damaged target SDDL tables and/or a program logic error.
- Action: Make sure the IDS Analyzer run that produced the target SDDL tables terminated normally with no errors. It is doubtful that the Restructurer or TDL Analyzer could have executed successfully if this error occurs. If all else fails, contact the Data Translation Project.

3. "##ERROR...ADBMS ERROR OCCURRED WHILE ATTEMPTING TO LOCATE DETAIL TYPE OF THESE PREVIOUSLY STORED MASTERS - IDS REC TYPE STORED FLAG"

Cause: The Writer was attempting to determine which detail type was to be stored next when this fatal error occurred. The following is a list of possible causes:

The SDDL tables have been damaged as in error #2.

2. The user has changed the record type identification numbers between compiling the target MD section in activity 3, and the time that the target SDDL tables were created by the IDS Analyzer.

3. A disjoint, invalid IDS structure was defined in the battern of the target MD section.

Alphapetic characters.

those to be written.

. Preschat characters.

1. PETCHEO TYPE NOT STOKED IS -

Action: The first two causes are self-explanatory; the third requires examination of the error message. Draw a picture of the database marking the records with an "X" if stored by this point (indicated by a "1" in the STORED column). There must be at least one record that is a detail of only records marked with an "X", if not, an invalid IDS structure has been defined.

the error occurs in cause, the action to be taken to correct each error,

4. "###ERROR...ADBMS ERROR OCCURRED WHILE ATTEMPTING TO LOCATE OWNER RECORDS (GETOWN) FOR TYPE - _____

Cause: See error #2.

Action: See error #2.

5. "###ERROR...DATABASE NAME _____ NOT FOUND###"

Cause: The name of the database supplied to the Writer by the user as a run-time parameter is invalid. This is a fatal error.

Action: Check to be sure that the database name is spelled correctly and that this database is described by the SDDL tables included in the JCL.

6. "###ERROR...DBNAME IS EMPTY###"

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Cause: The user has not supplied the name of the database the Writer is to work on as a run-time parameter. This is a fatal error.

Action: Correct the JCL so that the first line of the data file assigned to I/O device 15 is the name of a database consistent with its name in the SDDL tables.

Action: Make sure the IES Analyzer run that produced the target SDRL tables terminated normally with no errors. It is doubtful that the Restructurer or IDL Analyzer could have executed successfully if this error occurs. If all also table contact the fact Translation Project.

7. "##	ERRORERROR IN GTSYON, CAN'T FIND SYSTEM SET NAME FOR- "
Cause:	Certain records in the SDDL tables were built incorrectly or incompletely. Alternatively, the Writer has damaged itself during execution. This is a nonfatal error.
Action:	Restructurer. This error at fennoared notation, founded with error 438. This is a nearly for the application, founded with error 438. This is a nearly a percent
RECO	RD IDENTIFIED BY- FOR CHAIN- " Ba at invert JUT add stand chait
Cause:	An invalid IDS Definition Structure was created because an erroneous MD section was written. This is a nonfatal error.
Action:	Ensure that the compilation of the MD section in activity 3 was correct See also solution for error #9.
	See also solution for error 33.
9. "##	FERRORFOMOD DISCOVERED INVALID IDS STRUCTURE TABLE, ERROR# =
Cause:	An invalid IDS structure was defined in the target MD. The IDS Translator does not catch all semantic errors in the coding. The error # is: 1 - No RDs in structure table 3 - A field increment and field length>3813 4 - Last FD pointer does not point to an RD
	5 - Last RD pointer does not point to CCBLC It is possible that if activity 3 was not checked for errors this message will appear. It is a fatal error.
Action:	Check activity 3 for errors. Check also to make certain that each 98 CHAIN MASTER entry has at least one 98 CHAIN DETAIL entry. Carefully examine the MD section for syntax errors that IOS might not detect.
10. "##	SERROR. GETICAT ROUTINE RETURNED ADBINS ERROR OF- ATTEMPTED
	Seerror #2. This is a nonfatal error and a serzogen
Action:	se: Improper JCL for executing the Writer. This is a Call Toppe sec.
	FERRORGETRO SUFFERED SOME ERROR, FOR IDSREC, RECORD NAME
Cause:	A Writer initializing routine could not locate a record definition for the given record name. It was probably caused by an invalid IDS Definition Structure. This is a fatal error.
Action:	Successfully Error to the Onl Writer during Regirustrates and this the nonfetal error

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"**PERROR ERROR IN GTSYON, CAN'T FIND SYSTEM SET HAME FOR	• • •
12. "AMERICA. GETREF HAD ADONS ERROR OCCUR FOR DBKEY- WHILE LOOKING FOR OWNER - SET - SET -	Cau
Cause: The record was not linked up on the set specified by the Restructurer. This error almost always occurs because the TDL was not written correctly for the application. Coupled with error #38. This is a nonfatal error.	
Action: Check the TDL, rewrite and rerun the TDL Analyzer and Restructurer.	.3
supplied to stand to structure was created to all bilevel na 13. "##FERRORGETTOP HAD A ADBRS ERROR INDICATED BY CODE #	មទៀ
Cause: 00 See error #276 This is a fatal error not at 1 fat one and set set set Action: See error #2.	ist ist
" ###ERROR FOMOD DISCOVERED TOVALID TOS STRUCTURE TABLE, ERROR CODE	.0
Cause: Improper JCL for executing the Writer. This is a fatal error.	(au
Action: Check file code essignments as specified in Section 9.7.	•
15. "###ERROR EMPOSSIBLE TO LOCATE MASTER DEF'N FOR CHAIN-	
Cause: The user has substituted or changed the target MD section between the creation of the target SDDL tables and the execution of the Mriter. In particular, the location of the chain pointer fields has not remained constant. This is a nonfatal error.	Act
Action: Make sure the 98 level entries have not been transposed since the IDS Analyzer run. All item lengths should remain constant. If an error is found, rerun the Writer after correcting the MD.	.10.
16. "##ERROR IMPOSSIBLE TO OPEN TARGET SOOL " A STATE .S. TOTTE 982 :98	Caun
Cause: Improper JCL for executing the Writer. This is a fatal error.	Act
Action: Check file code assignments specified in Section 39.7.10	.11
17. "###ERRORIMPOSSIBLE TO STORE REFERENCE CODE. IERR RETURNED WITH A ROSITIVE VALUE FROM SFK. IERR CODE. IERR RETURNED WITH Cause: Creation of the target RIF(did not execute	Caus
Cause: Creation of the target RIF did not execute successfully. Error in the DDL Writer during Restructurer run.	Act

Action: Check the output of the DDL Writer from the Restructurer for errors. Erroneous information means that the target SDDL tables were not properly created. Refer to the section on the IDS Analyzer.

18. "###ERROR...IMPOSSIBLE TO STORE REFERENCE CODE OF TARGET RECORD—
WITH DBKEY IN RIF OF— PROCESSING CONTINUES BUT ERRORS MAY OCCUR
LATER WHEN ATTEMPTING TO STORE DETAIL RECORDS OF THIS MASTER"

Cause: See error #17. This is a nonfatal error.

Action: See error #17.50 kompany and the constraint and the constraint

19. "##ERROR... INCONSISTENCY BETWEEN TARS ROUTINE GTDETL WHICH CLAIMED THAT TYPE- HAD MASTER TYPES AND ROUTINE GETONN WHICH COULDN'T FIND ANY MASTERS.

The target fill tables have been semiously democal since the

Action: See error #2.

Cause: See error #2. This is a fatal error.

20. "###ERROR...INCONSISTENCY IN ROUTINE GETONN, RECORD TYPEWAS NOT RETURNED IN INITIALIZATION ROUTINE GETREC"

Cause: See error #2. This is a fatal error.

Action: See error #2. same a peak to the action of the same in

21. "###ERROR...INVALID RUN-TIME INPUT, FORMAT MUST BE A6, 1X, A6. VALUES READ WERE - ____

Cause: The second line of data residing on file code 15 is not in the proper format to be used as a run-time input parameter(s). This is a fatal error.

Action: Make sure that the input parameters to the Writer are as speci-

otherwise correct extended target MD section, revum the 195

22. "##ERROR...INVALID USER SPECIFIED RECORD TYPE NAME, EXECUTION CONTINUES. INVALID NAME IS _____

axamine paer dono closely. This is a nontakal erver

Cause: The user has supplied a record type name on file code 15 which is not a record type in the target database to be created by the Writer. This is a nonfatal error.

Action: Check the Writer JCL to be sure that the record type name is spelled and formatted properly. Check also to be sure that the target database file, the SDDL tables file, and the database on file code 15 are consistent.

23. "###ERROR...LENGTH OF- DISP OF- FOR ITEM- OF RECORD-EXCEEDS BUFFER MAX OF 3840 CHARACTERS*

horades eat of well-sk

- were not properly created. While building a target record, one of the Writer's internal vectors overflowed because the sum of the record's item lengths was too large. This is a nonfatal error.
- Action: Either redesign the target database so that the record will not be greater than 3840 characters or contact the Data Translation Project to modify the internal table. . This is a Montale
- "###ERROR...MASTERLESS RECORD TYPE OF-DOES NOT EXIST WITHIN
- The target SDDL tables have been seriously damaged since their creation. This error would appear only under very unusual circumstances. It is a nonfatal error. PING BUY MESTERS.

Action: See error #2.

"###ERROR...NEGATIVE NUMBER ENCOUNTERED IN 'STORED' ARRAY. NUMBER

Cause: See error #2. This is facel error.

- Cause: An internal Writer vector has an element whose value is negative. This is a fatal error, to a second that the all describes the ZA
- Action: This error can occur only if the integrity of the data stored on file code 16 has been violated, or if there is a program logic error of the Writer. In either case, contact the Data Translation Project.
- BA .AT .88 BE TZEM TANGOT, TURNE BANT AUG CIJAVAI... SORSENAP .IS "###ERROR...NO MAPPAR ELEMENTS FOR RELAY- " - BARN GARS
- Cause: Error in construction of SDDL tables for target IDS database. No indication was made of the location of pointer items that implement this relation. Check SDDL table creation run and examine user dump closely. This is a nonfatal error.
- Accion: Maka sura that the inout parameters to the Writer are as speci Action: If no error can be found, contact Data Translation Project, otherwise correct extended target MD section, rerun the IDS Analyzer and then rerun the Writer. If the user error would have had an impact on the integrity of the Restructuring execution, then the TDL Analyzer and Restructurer must also be rerun prior to Writer execution. Cause: The user has supplified a record type name on file code 15 which is
 - not a record type in the target database to be created by "###ERROR...NOT POSSIBLE TO OPEN TARGET RIF"
 - Cause: Incorrect JCL setup for Writer execution. This is a fatal error.
 - spelled and formatted proceedy. Check also to be sure that the Action: Check the JCL to ensure that file 02 is a random file which represents the target RIF database. Indicate and are all about all

"###ERROR...NUMBER OF MASTER-LESS RECORD TYPES IS NOT BETWEEN 1 AND 50. Tatlet reffer a begue agh aid! Competis Low triens of The user has violated a Writer internal limitation. There cannot Cause: be more than 50 or less than 1 record types that do not have masters, e.g., are not described by a 98 CHAIN DETAIL (other than CALC). This is a fatal error. Action: Redesign target database so that the above restriction is observed. Lause: incernal Writer Louis error. This is a fatal error. "###ERROR...NUMBER OF TARGET IDS RECORDS IS NOT BETWEEN 1 AND 75, . IF NUMREC >75, VECTORS MUST BE REDIMENSIONED AND PROGRAM RECOMPILED" The user has attempted to create a target database of greater than 75 record types and has thereby exceeded the Writer's internal table size. This is a fatal error. Action: Several vectors in the Writer and the program code which checks table size overflow must be changed and the program recompiled. This should be done only by Data Translation personnel. An easier solution is to design a smaller target database. "###ERROR...NUMBER OF UNIQUE FIELDS IN RECORD TYPE- EXCEEDS WRITER MAXIMUM OF 60." Legidas JOCA deposas edi nitw empidano The user has violated a Writer limitation of 60 fields per Cause: record size. This is a fatal error. Action: Redesign the target database and start over. Alternatively, contact the Data Translation Project to modify the Writer. 182083 "###ERROR...OWNER OF SET- WAS NOT STORED, DETAIL IGNORED" Cause: While attempting to store a record type, the Writer discovered that not all of this record type's masters had been previously stored. Therefore, the detail could not be stored. Generally a result of previous error #12's occurrence higher in the database structure. This is a nonfatal error. Action: Make sure that the Writer is supplied with the name of the owner record of the set mentioned on the next run of the Writer. of the 198 Definition Structure of scovered on towall's structure. 32. "###ERROR...RECORD- IS DETAIL IN GREATER THAN 10 CHAINS, EXCEEDS Action: Check activity 3 setant for correct compline by "xxxx RETIRN

the error is in 96 CHAIR MASTER eaches. Cornect and noting the

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Cause: A record is defined in the target database as a detail in more than 10 chain relations. This has caused a Writer table to overflow. This is a nonfatal error.

This is a facal error.

record size. This is a fatel group,

Action: Redesign the database or contact the Data Translation Project.

IS A DETAIL RECORD BUT "###ERROR...ROUTINE GETTOP CLAIMS ROUTINE GIBETL CLAIMS THAT IT IS NOT A MEMBER OF ANY SET."

Internal Writer logic error. This is a fatal error. Cause:

Action: Contact Data Translation Project.

IN ORIGINAL LIST OF LEGAL GROUPS"

BUT IS NOT Debesave versed as bos peaks becase 27

Cause: Internal Writer logic error. This is a fatal error.

Action: Contact Data Translation Project. 885 M 230539 1276892 107534 table size overflow quat be changed and the propram recompiled. This should be none only by Oata Translation personnel. An

"###ERROR...ROUTINE GTFLD SUFFERED ADBMS ERROR WHILE LOOKING FOR FIELDS OF RECORD TYPE-

Cause: Accompanied by an ADBMS traceback, this error indicates serious problems with the target SDDL tables. This is a nonfatal error.

Action: " See error 12 to noticated the writer limitation of 12 and the course

"###ERROR...SUBRCUTINE VALREC HAS RETURNED AN ILLEGAL RETURN CODE." RETURN CODE . VITE MI OF TOWN OF THE

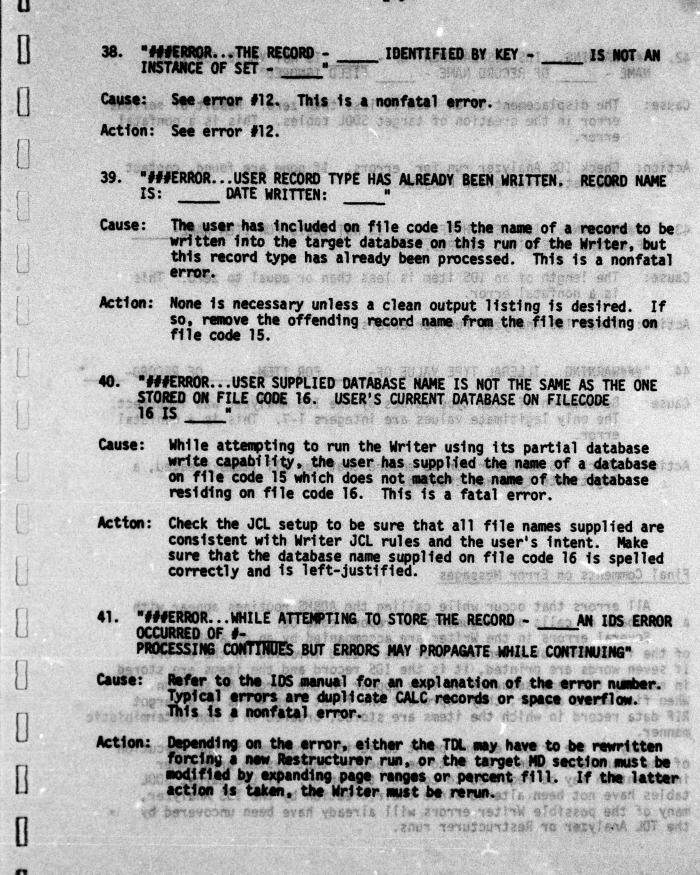
A parameter passed back to the Writer from a support module is illegal. This is a fatal error.

Action: This error can occur only as a result of a serious program logic error. Contact the Data Translation Project. stored. Therefore, the detail could not be scored. Senerally a result of previous error \$18's occurrence higher in the data-

"###ERROR...SUMSCM RETURNS ERROR CODE OF- EXPLANATION. SEE SUMSCM DOCUMENTATION" Account Make sure that the Writer is supplied with the he

Cause: A Writer routine that modifies bits in detail definition records of the IDS Definition Structure discovered an invalid structure. This is a fatal error. MI JIAT30 21 SE MARKERON DECON

Check activity 3 output for correct compiling by IDS Translator. The error is in 98 CHAIN MASTER entries. Correct and rerun the Writer.



42. "FFFNARNING...IDS DISPLACEMENT OF - IS NOT VALID FOR ITEM NAME - OF RECORD NAME - FIELD IGNORED" Cause: The displacement of an item is less than zero. Result of serious error in the creation of target SDDL tables. This is a nonfatal error. Action: Check IDS Analyzer run for errors. If none are found, contact the Data Translation Project. 43. "###MARNING...IDS LENGTH OF- IS NOT VALID FOR ITEM NAME-OF RECORD NAME-FIELD IGNORED. this record type has already been processed. The length of an IDS item is less than or equal to zero. This is a nonfatal error. beyland at onital Action: Check IDS Analyzer run for errors Partners and accept the file code 15 "###WARNING...ILLEGAL TYPE VALUE OF- FOR ITEM- OF RECORD-Generation of item type values by the IDS Analyzer was incorrect. Cause: The only legitimate values are integers 1-7. This is a nonfatal Cause: While accempting to run the Writer using its partial database Action: Check IDS Analyzer run to ensure that for all items created, a as legitimate type was created. In and mark of about 11 no partition Action: Check the JCL satur to be suge that all file names supplied are consistent with Writer JCL rules and the user's intent. Make sure that the database name supplied on file code 18 is spelled Final Comments on Error Messages Defiliant after vitamino

All errors that occur while calling the ADBMS routines appear with

a traceback of calls and arguments on report code 06.

Several errors in the Writer are accompanied by an octal-BCD dump of the first five or seven words of the record involved in the error. If seven words are printed, it is the IDS record and the items are stored in exactly the same sequence as they appear in the target MD section. When five words appear, they represent the first five words of a target RIF data record in which the items are stored, ordered in a non-deterministic manner.

Many of the Writer errors point to serious problems in the execution of the Translator code. It is to be expected that system programmer intervention may be required to correct the error. If the target SDDL tables have not been altered since their creation by the IDS Analyzer, many of the possible Writer errors will already have been uncovered by the TDL Analyzer or Restructurer runs.

F.O ADBMS OVERVIEW

ADBMS, like IDS, is a database management system which facilitates the creation, maintenance and accessing of simple and complex data structures. It consists of a collection of FORTRAN-callable subroutines whose purpose is to create databases from a user's data structure description, and to serve as an interface between the user and these databases.

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ADBMS is used by the Data Translator as follows:

IDS Analyzer

creates SDDL tables (ADBMS database)

b) uses Internal Work Database (ADBMS database) internally

TDL Analyzer

- vogra portear pro ve ta a) retrieves information from source and target SDDL tables (ADBMS
 - b) creates TDL tables (ADBMS database)

Reader

- uses source SDDL tables (ADBMS database) as input a)
- creates source RIF (ADBMS database)
- c) uses DRT (ADBMS database)

Restructurer

- retrieves data from source RIF (ADBMS database)
- stores data in target RIF (ADBMS database)
- accesses TDL tables (ADBMS database)

Writer

- a) uses target SDDL tables (ADBMS database) as input
 - b) uses target RIF (ADBMS hash database) as input.

F.1 Describing an ADBMS Database -- The DDL

Every ADBMS database is logically described in terms of sets, records, and items. These ADBMS constructs are similar to the IDS chain, record, and field constructs. Records are composed of items and are related by

There are two types of ADBMS records, hash and non-hash, whose principle difference lies in the method used to store them. While non-hash records are simply stored in the next available space in the database, the storage algorithm used for hash records is similar to that of the IDS calculated record. That is, one or more items in the hash record are specified as primary key items and are hashed, or randomized, to determine the location of the record in the database.

There are also two types of ADBMS sets, ordered and match-key, which are defined in terms of their owner and member record types, just as IDS chains have master and detail record types. Ordered sets can be used to specify relationships among records and may be ordered in a variety of ways. An ADBMS ordered set differs from an IDS chain in that it is allowed more than one owner record type. The second type of ADBMS set, the match-key set, can have only one owner record type which must be a hash record. The member-to-owner relationship is established by storing the primary key items of the owner of the set in the set-significant items of the member.

The Data Description Language, or DDL, is a language used to describe a database in terms of the constructs specified above. A specific database description written in this language is also called a DDL and corresponds to the IDS MD Section.

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F.2 The DDL Analyzer/Database Initializer

The DDL Analyzer/Database Initializer is a utility routine used in creating ADBMS databases. The first step in the creation of an ADBMS database is the writing of a DDL to describe it. This DDL and some optional hash input information are then input to the DDL Analyzer/Database Initializer whose purpose is twofold. First, it analyzes the DDL description of the database, and checks for syntactical errors and inconsistencies. This first stage is similar in function to that of the IDS Translator. If it is successful, the database tables are produced and used, along with the optional hash input, to initialize the ADBMS database. The second stage, comparable to the IDS program QUTI, involves the determination of the parameters to be used by the hashing algorithm to store hash records. The user has the option of specifying some or all of these parameters as hash input to the DDL Analyzer/Database Initializer, or simply accepting default values determined during initialization. Figure F-1 summarizes the function of the DDL Analyzer/Database Initializer. Alternate modes of operation allow the user to forego the database initialization stage and receive as output only the database tables, or to input the database tables instead of the DDL and bypass the DDL analysis stage. wasdeteb 2MGGA: TRC seau

F.3 The ADBMS Database and Database Tables

An initialized ADBMS database consists of physical pages on which all information in the database is stored. The database tables produced during the DDL analysis stage of the DDL Analyzer/Database Initializer are stored on the first page(s) of the database. They contain the logical description of the database according to the DDL and are comparable to the IDS Definition Structure. The remaining pages are initialized according to a specific format very similar to the pages of an IDS database. Before operations can be performed on a database, the database must be opened, at which point its tables are read from the database back into core where they are used to retrieve descriptive information about the database and to store additional information required by ADBMS when performing operations on the database.

ADBMS databases which contain hash records are often referred to as hash databases; those not containing hash records are referred to as nonhash databases.

F.4 Multiple Databases ADBMS has the capability to manage multiple databases simultaneously. That is, operations can be performed first on one database and then another without closing the first database and opening the second database between operations. This capability is made possible by the concept of a current database. Rather than close one database and open another, the user keeps all necessary databases open at the same time and simply resets the current database. All database tables corresponding to open databases are in core simultaneously; one set of them is associated with the current database.

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than one owner record type. The second type of AUGHS set s.F.5 Database Keys of feen doing says brooms reque one gine even not jos

Each physical record stored in the database is uniquely identified by its database key. A database key specifies the page and displacement within that page where the record is located. Whenever a record is accessed, the page on which it is stored must be brought into core. to the JOS MD Section.

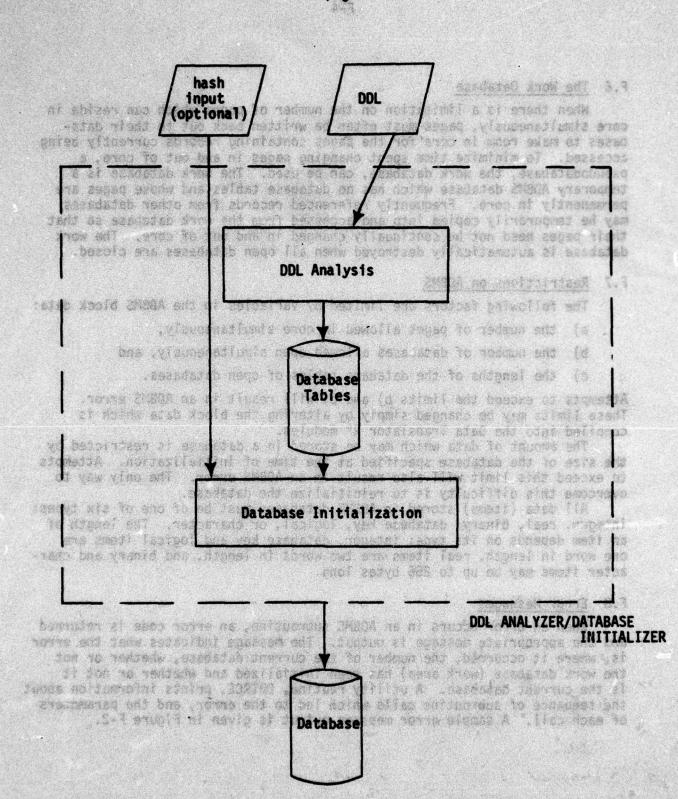


Figure F-1 DDL Analyzer/Database Initializer

F.6 The Work Database

When there is a limitation on the number of pages which can reside in core simultaneously, pages must often be written back out to their databases to make room in core for the pages containing records currently being accessed. To minimize time spent changing pages in and out of core, a pseudodatabase, the work database, can be used. The work database is a temporary ADBMS database which has no database tables and whose pages are permanently in core. Frequently referenced records from other databases may be temporarily copied into and accessed from the work database so that their pages need not be continually changed in and out of core. The work database is automatically destroyed when all open databases are closed.

F.7 Restrictions on ADBMS

The following factors are limited by variables in the ADBMS block data:

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- a) the number of pages allowed in core simultaneously,
- b) the number of databases allowed open simultaneously, and
- c) the lengths of the database tables of open databases.

Attempts to exceed the limits b) and c) will result in an ADBMS error. These limits may be changed simply by altering the block data which is compiled into the Data Translator R* modules.

The amount of data which may be stored in a database is restricted by the size of the database specified at the time of initialization. Attempts to exceed this limit will also result in an ADBMS error. The only way to overcome this difficulty is to reinitialize the database.

All data (items) stored in ADBMS databases must be of one of six types: integer, real, binary, database key, logical, or character. The length of an item depends on its type; integer, database key and logical items are one word in length, real items are two words in length, and binary and character items may be up to 256 bytes long.

F.8 Error Messages

When an error occurs in an ADBMS subroutine, an error code is returned and the appropriate message is output. The message indicates what the error is, where it occurred, the number of the current database, whether or not the work database (work area) has been initialized and whether or not it is the current database. A utility routine, DBTRCE, prints information about the sequence of subroutine calls which led to the error, and the parameters of each call. A sample error message output is given in Figure F-2.

Figure F-1 ... Analyzer Dytalizer

ERROR # 17 IN CRX (LEVEL 3) DR = 4	
MORK AREA INITIALIZED. #1529 THE TRETTERSON SEASATAD	
MORK AREA CURRENT. #1530 TESTCIONADEL GRASATAG	01
ROUTINE DBTRCE. STATEMENT 11. #1531 PARAMETER ADDR BCD OCT INTEGER	TI
PARAMETER ADDR BCD DCI INTEGER	28.8
1 000000070111 000000 00000000000 TON 3071 O	04
ROUTINE DREFR STATEMENT 99 #1534 PARAMETER ADDR BCD OCT INTEGER	-61-9
	ne int
2 00000065702 000000 0000000000	52'00 UD
ROUTINE CRX . STATEMENT 158 #1538	la nonen
ROUTINE CRX . STATEMENT 158 #1538 PARAMETER ADDR BCD OCT INTEGER	Živija i
1 000000130502 00001E 000000000125 35 2 000000130503 00000A 00000000001 17	
2 000000130503 00000A 0000000000021 17	ne tine
POINTINE STREEP, STATEMENT 118 #1542	48
PARAMETER ADDR RCD OCT INTEGER	o Become
1 000000.114717 0000[R 000000001251 631	3.0
2 000000114720 000000 00000000000 0 3 000000114721 000004 000000000001 17	racess
3 000000114721 00000A 000000000021 17 ROUTINE STREED, STATEMENT 160 #1547	
PARAMETER ADDR BCD OCT INTEGER	90
1 000000110226 000000 00000000000	. D. W.
ROULINE ALANA SIRITMENI 100 E100	
PARAMETER ADDR BCD OCT INTEGER	week areas
1 000000061014 000000 00000000000 0	CAR -
	3 4 5
Figure F-2	and the second
ADBMS Error Message Output	
	Total State of the

person, the way bearing at an erecte all Typesper Short Charest to a

	The following is an explanat	tion of all possible error codes.
01	DINT HAS NOT BEEN CALLED	LYBRATH RISE TO HOLIARD CLIAVE, DE
02	INVALID SET TYPE	datalogs, created under the star's Dastat
03	INVALID RECORD TYPE	F.9 References
04		The following references applies a bace management system on which folks is
05	INVALID OWNER TYPE	G A Hershey III and W. M. Massiner A D
06		Based on 0010 71" [5005 York (ng Paper no
07	THANKED MILLOUGE ICE.	M. J. Dastarache and E. Ar Werehelp "II" " Manual and Example" ISBOS Northy Phoper
08	NO CURRENT OWNER OF SET	sending the selection of the selection of the selection of the selection of the selection and P. W.
09	NO CURRENT MEMBER OF SET	Simon reas persent 2001 2002
10	NO CURRENT OF RECORD TYPE	
11	ALREADY MEMBER OF SET	File content
12	RECORD NOT MEMBER OF SET	ACCRC database
13	DEPENDED ON ITEM OUT OF RANGE	Date:
14	DATABASE ALREADY OPEN	III database

15 DOL TABLES INCONSISTENT

15P Fadex

- 44. 15

- DATABASÈ INCONSISTENT
- DATABASE OVERFLON
- SET TYPE NOT SORTED
 DINT HAS ALREADY BEEN CALLED
- INVALID NUMBER OF BUFFERS

 NO CURRENT DATABASE

 TOO MANY DATABASES
- 21
- ILLEGAL I/O UNIT FOR DATABASE
- ILLEGAL I/O UNIT FOR DATABASE TABLES
 ILLEGAL USAGE VALUE
- DATABASE TABLE OVERFLOW
- ILLEGAL CURRENT DATABASE
 INVALID OPERATION ON SYSTEM RECORD
 DATABASE OPENED FOR READ ONLY
 INVALID ITEM POINTER
 INVALID RECORD POINTER

- INVALID SET POINTER
- INVALID PAGE NUMBER JUSTED SPEEDS TOTAL CORNER 37
- INVALID HASH INPUT 38
- INVALID RECORD STORAGE METHOD
- INVALID OPERATION ON PRIMARY KEY

F.9 References

SAYT MANDER PREMIUME The following references provide a detailed explanation of the database management system on which ADBMS is based.

DE DINT-YAS HUT BEEN CALLED

NO NO CURRENT OF RECORD TYPE

30MAN TO TWO MOTE MO GEORGISS OF

IT ALREADY MEMBER OF SET 12 RECORD NOT PRIMBER OF SET

TA CATABASE ALREADY OPEN AS COLTABLES ENCONSISTENT

SE INVALLA SET TYPE:

Figure P-2

- E. A. Hershey III and P. W. Messink "A Database Management System for PSA Based on DBTG 71" ISDOS Working Paper no. 88, July 1975.
- M. J. Bastarache and E. A. Hershey III "The Database Management Sytem User Manual and Example" ISDOS Working Paper no. 89, April 1975.
- E. A. Hershey III, R. L. Dissen and P. W. Messink "A Description of ADBMS Verston D210" ISDOS Working Paper no. 122, July 1975.

APPENDIX G

S. W. ST

SYSTEM GENERATION

The Version IIA Release 2 Data Translator is supplied to the user on a Honeywell system - standard format 9-track tape. This section describes the files on the System Generation tape and the files a user must create to run the Data Translator.

The first file on the System Generation tape is the table of contents. Figure G-1 is the preliminary table of contents for the tape. After the table of contents, the tape contains the files for the IDS Analyzer, TOL Analyzer, Reader, Restructurer, and Writer. The last two files on the tape are the translation library and the DOL Writer's work database.

To bring the Data Translator up on a system the user should complete

the following steps:

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 Read the entire User Manual. The entire Data Translation process should be thoroughly understood before any modules are run. All questions should be sent to the Data Translation Project. RESEA LELIEBINGUESIS

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100

- Copy the first file from the tape into a 10 llink, sequential, permanent file. Convert the file to ASCII using BCDASC and print it out. The first file has the table of contents for the tape and some sample JCL for bringing the remaining files off the tape.
- 3. Using either FILSYS in batch or ACCESS in time-sharing, create all of the files for the Translator. Figure G-1 shows the type, length and suggested name for the files on the tape. At this point, the user should also create all files needed by each module (see Sections 5, 6, 7, 8, 9).

Due to the large number of files used by the Data Translator, the user will find it beneficial to segregate the files used by each module. The following catalogs, created under the user's master catalog, are recommended.

The following suffixes should also be used on file names:

Suf	f1x				ile	content	-
.AF				•	ADBMS	databas	e
TA.			Cal Colorage Star et al.	1	ADBMS	DBTF	******
.0					lata		
. ID	0.000	4	01			tabase	Tax
. IF					ISP 1	ndex	

	System Generation Tape	on lape		user remanent rije	
e a	Module 55	Contents A Property P	Suggested Name	Size (1) inks) =	Mode
-	385 -	Table of Contents, Sample JCL	the captured of the captured o	50	Seq.
2	IDS Anal.	Prototype JCL 17 W W W W W W W W W W W W W W W W W W	/IDSM/PROTO.J	diff in the control of the control o	Seq.
6	IDS Ana E	K* Source Library Grant of	taba taba r Sm tes les n Pr	ed to Sec User Sec Sec	Seq.
•	IDS Anal.	Phase I R* Elle Course the Course	/IDSAN/PHASI.RS	1000 1117 188 198 198 198 198 198 198 198 198 198	Se
9	IDS Anal.	Phase 2 R* File	/IDSAN/PHAS2.RS	21	, Seq.
1188	TOS Anal.	SDDL Table's DBTF	/TDSAM/SDDL.AT	orsi kon d bn Dot motor	Seq
	IDS Anal.	Grande 1 08TF Co.	/IDSAN/INTRN.AT	7.20 3.4 300 300 5750	Seg.
8	A Chicagolical Colors	Prototype JG.	/TDL/PR0T0.3	Osta on on on os os os os	
9	TDL Anal.	K* Source Library	urer nslas nslas ser i nl v be se	99 276 6790 • 1272 716	Seq.
92	TDL Anal.	Main TDLAN Re FIDe and	/TDL/TDLM.RS	3 (a)	Sed.
=	TOL Anal.	SYSACC R*File support the state of the state	/TDL/SYSAC.RS	100 100 100 100 100 100 100 100 100 100	Seq.
12	TDL Anal.	Compactibility Re-Fille, 194	/TDL/CMPAT.RS	30	Seq.
13	TOL Anal.	TOL Dump R* Frie	/TDL/TDDMP.RS	292	Seq.
=	TDL. Anel.	TOL Table's DBTF	/TDL/TDL.AT	ood 9 on Inter	Seq.
15	TDL Ana 1.	TOL Parsing tables	/TDL/PARSE.D	15	Seq.

Figure 6-1

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Figure 6-1 (cont'd)

				The state of the s	NAME OF TAXABLE PARTICULAR PROPERTY.
Ji Se	Hodule	Contents	Suggested Name	Size (11inks)	9
- - -	Restructurer	Re Frite	/REST/REST.RS	8	Sed
32	WTter	Prototype 3CL	/MTR/PROTO.3	3.1	Š
a la	Britar.	K Source Library		Age of the second secon	Š
9 8	Writer	COBOL Source - Part 1	/wm/coel.s	3	ġ
8	m for	COBOL Source - Part 2	/MR/COB2.S	4	S
7 kg	Thirtier.	Po File	/WR/WRITE.RS	52	ğ
37	:	Translation Library K* Source	Constant	-	3
8		Translation Effery Library	/UTIL/TRANS.LR	336	Rand.
39		DOLUT Work Detabase	AUTIL/MRKOB.AF	2	Rand.
61	Reducti	And St. Studies Tibrata			
(33) Hely	Heeger		ARMAZIO T	4/9	Š
		Figure 6-1 (conf'd)	(a) \MBAILSh**3	v	2
4	18.04	24 22 24 24 24 24 24 24 24 24 24 24 24 2		p.o.	ä
			sould be training	2 Sec. 19.	9503

<u>Suff1x</u>	File content
.is .j	ISP database
.J	JCL
.KS	K* source library
.LR	Random library
.MD	IDS MD section
.PM	IDSAN run-time parameter file
.RS	R* file
.\$.\$Q .\$R	Source code
. S 0	Sequential database
.SR	Source RIF
.ST	SDDL tables
.T0	TDL description
.TR	Target RIF
. 11	TNI tables
.61	TDL tables
	Extended IDS MD section

- 4. Copy all files from the tape to permanent files. Note that no K* files are needed to run the Data Translator. Sample JCL to copy the files is in the first file on the tape. The two random files should be brought off the tape using the RREST Utility command. The Reader and Writer's source code (files 22, 23, 34, 35) should be converted from BCD to ASCII using BCDASC.
- 5. Convert all JCL files to ASCII and edit the JCL for each module so the proper files are referenced. See Sections 5, 6, 7, 8, 9 for the changes to be made in each JCL file. Each module can be run after completing its checklist in the User Manual.